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Minnesota Forest Statistics, 1990, Revised

Patrick D. Miles, Chung M. Chen, and Earl C. Leatherberry

North Central Forest Experiment Station
Forest Service—U.S. Department of Agriculture
1992 Folwell Avenue
St. Paul, Minnesota 55108
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1995

This report includes the most commonly used Forest Inventory and Analysis statistics. Additional forest resource data can be provided. Persons requesting additional information from the raw inventory data are expected to pay the retrieval costs. These costs range from less than $100 for a relatively simple request to $2,000 for a complex retrieval involving the services of a Forest Inventory and Analysis computer programmer. Requests will be filled so as to minimize the impact on the Forest Inventory and Analysis Work Unit.

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FOREWORD

Since the original *Minnesota Forest Statistics, 1990*, Resource Bulletin NC-141, was published in 1992, a number of errors have been noted that affect the published results. The number of affected tables and the amount of change needed to published figures were considered to be sufficient to warrant publishing a corrected resource bulletin, rather than issuing an errata sheet. These changes reduced the reported area of timberland by 0.3 percent, increased the volume of growing stock by 0.3 percent, and increased growing-stock average annual growth by 0.5 percent. We regret any inconvenience this may have caused.

The fifth inventory of Minnesota was directed by Neal P. Kingsley, Forest Inventory and Analysis (FIA) program manager. David F. Heinzen, supervisor for the Minnesota Department of Natural Resource's (DNR) Resource Assessment Analysis Program, was responsible for overseeing DNR personnel and contract field crews. Jerold T. Hahn and Mark H. Hansen were responsible for inventory design. Arnold (Jerry) Ostrom supervised the FIA field crews, which were responsible for collecting field data in the Central Hardwood and Prairie Units and in part of Itasca County. Steve Flackey of the Minnesota DNR supervised the field crews that collected data in the Aspen-Birch and Northern Pine Units. Elizabeth C. Collins supervised FIA's photo interpretation staff, while George Deegan of the Minnesota DNR was responsible for supervising State photo interpreters.

FIA field crew members:
Nancy Ady, Karen Brand, Becky Bryan, John Bryan, Michael Burns, Paul Castillo, Mark Dilley, John DuPlissis, Loren Eide, Jay Flynn, Mark Hamel, Cheri Hartless, Patrick Hartless, Robert Haukereid, Douglas Hecker, Glenda Hefty, Gary Inhelder, Peter Koehler, Gary Larson, William Nelson, William Peters, Ron Piva, Lois Poppert, Loren Poppert, Ed Rumbold, Nicholas Severson, Jerry Van Cleve, Linda Weidel, Dan Wendt

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Training provided by Minnesota DNR disease and insect specialists increased the accuracy of tree class determination. These classifications now more accurately reflect the utilization of aspen and several other species. Training of field crews was done by Michael Albers, Jana Albers, and Ed Hayes. Tom Eiber and Alan Jones were responsible for the development of standardized disease and damage codes. Olin Phillips, Cooperative Forest Management Supervisor, established the cooperative framework.

FIA photo interpreters:
Rose Berg, Elizabeth Collins, Julie Fleming, Dale Gormanson, Mark Johnson, Barb Knight, Leo Larkin, Jay Solomakos, Mark Springen

Minnesota DNR photo interpreters:
Marty Casselius, George Deegan, John Falkner, Steve Flackey, Valiree Hanson, Craig Mellin, Greg Russell, Scott Seeley

Patrick D. Miles and Mark H. Hansen were responsible for generating area, volume, growth, and removals tables. William (Brad) Smith and Ronald L. Hackett collected and compiled data on timber product outputs and timber removals. Pat Murray and Jay Solomakos edited the data.

Mary Jean Hanson and Daniel S. Goodman provided administrative and secretarial support. Computer support was provided by Gerhard K. Raile.

Forest Inventory and Analysis (FIA) is a continuing endeavor as mandated by the Renewable Resources Research Act of 1978. Prior inventories were mandated by the McSweeney-McNary Forest Research Act of 1928. The objective of FIA is to periodically inventory the Nation's forest land to determine its extent, condition, volume of timber, growth, and removals. Up-to-date resource information is essential to frame forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories and publishing summary reports for individual States. The North Central Forest Experiment Station is responsible for forest inventory and analysis in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Fieldwork for the fifth Minnesota forest inventory was begun in April 1986 and completed in February 1991. Reports of four previous inventories of Minnesota's timber resource are dated 1936, 1953, 1962, and 1977.

More accurate survey information was obtained during this survey than otherwise would have been feasible because of intensified field sampling. Such sampling was made possible through the cooperation and assistance of the Minnesota DNR. Data for the Aspen-Birch and Northern Pine Units were collected by contract crews hired and supervised by the Minnesota DNR. The DNR installed several hundred additional plots on national forest land. These efforts increased the sampling intensity on national forest lands from a single intensity level to the triple intensity level that is typical of the rest of the State. Data for the Central Hardwood and Prairie Units were collected by FIA staff. To aid in determining current timber removals, the Minnesota DNR also surveyed primary wood-using plants in the State.

Aerial photos used in the forest inventory were purchased by the State from the U.S. Geological Survey. This photography was from the National High Altitude Photography program (NHAP). In addition, the Minnesota DNR provided 35mm true color prints at a scale of 1:15,840 of all of the 1977 plot locations to enable disturbance detection.

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Minnesota Forest Statistics, 1990, Revised

Patrick D. Miles, Chung M. Chen, and Earl C. Leatherberry

HIGHLIGHTS

NOTE: *Data from new forest inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since the last Minnesota inventory in 1977. Because some of these changes will make it inappropriate to directly compare the 1990 data with those published for 1977, data from the 1977 inventory have been reprocessed using the 1990 procedures. Please refer to the section labeled "Comparing Minnesota's Fifth Inventory With the Fourth Inventory" for more details.*

General

Minnesota is divided into four survey units (fig. 1), and separate statistical reports have been published for each unit. Unit boundaries roughly align with the three broad ecoregions in Minnesota. The Aspen-Birch and Northern Pine Survey Units in the north contain most of the State's boreal forest. The Central Hardwoods Survey Unit in the southeast is dominated by hardwoods. And the Prairie Survey Unit in the west, once open prairie, is now nearly 85 percent cropland.

The geology and soils of the northern two-thirds of the State are largely the result of glaciation. The flat area in the northwest corner of the State was once the basin of ancient Lake Agassiz. Bare bedrock and shallow soils in the northeast show the scars left by advancing and retreating glaciers. The sandy gravelly soils of parts of central Minnesota, along with potholes, drumlins, and moraines, are additional evidence of these recent geologic events. Southeastern Minnesota, largely untouched by glaciation, has a much older landscape. The valleys and bluffs in the southeast have been etched out over a much longer time period. Rivers, periodically filled to overflowing by glacial runoff, have carved valleys and bluffs from sedimentary layers deposited in ancient seas.

Forest Area

- The total land area of Minnesota is 50.9 million acres, of which 33 percent is forested. The area of all forest land in the State has increased by 0.7 percent since 1977 to 16.7 million acres. The current forest area includes 1.1 million acres of reserved forest land where harvesting is prohibited by statute or administrative designation. The largest area of reserved forest land (1.0 million acres) is in the Aspen-Birch Survey Unit, primarily the Boundary Waters Canoe Area Wilderness and Voyageurs National Park.

- There were 14,723,200 acres of timberland in the State in 1990, an 8.2 percent increase from 1977. Just over half of this increase resulted from the reclassification of unproductive forest land to timberland in 1990. Sample plots with a low site index (under 15 for northern white-cedar, 20 for black spruce and tamarack, and 25 for eastern redcedar; under 35 for all other species) were classified as unproductive forest land in 1977. Improved site index curves used in the 1990 survey placed many of these stands in the timberland category. The large increase in the black spruce and tamarack types in the

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Patrick D. Miles, Forester, received a bachelor's degree in forestry in 1981 and a master's degree in forest economics in 1984 from the University of Minnesota. He joined the Forest Service in 1984 and has been with the Forest Inventory and Analysis Unit since 1989.

Chung M. Chen, Senior Research Analyst for the Minnesota DNR, received a bachelor's degree in forestry from Taiwan National Chung-sing University, a master's degree from Yale, and a Ph.D. from the University of Minnesota.

Earl C. Leatherberry, Resource Analyst, received a bachelor's degree in geography from North Carolina Central University and a master's degree in geography from the University of Michigan. He joined the Forest Service in 1973, and has been with the Forest Inventory and Analysis Unit since 1985.

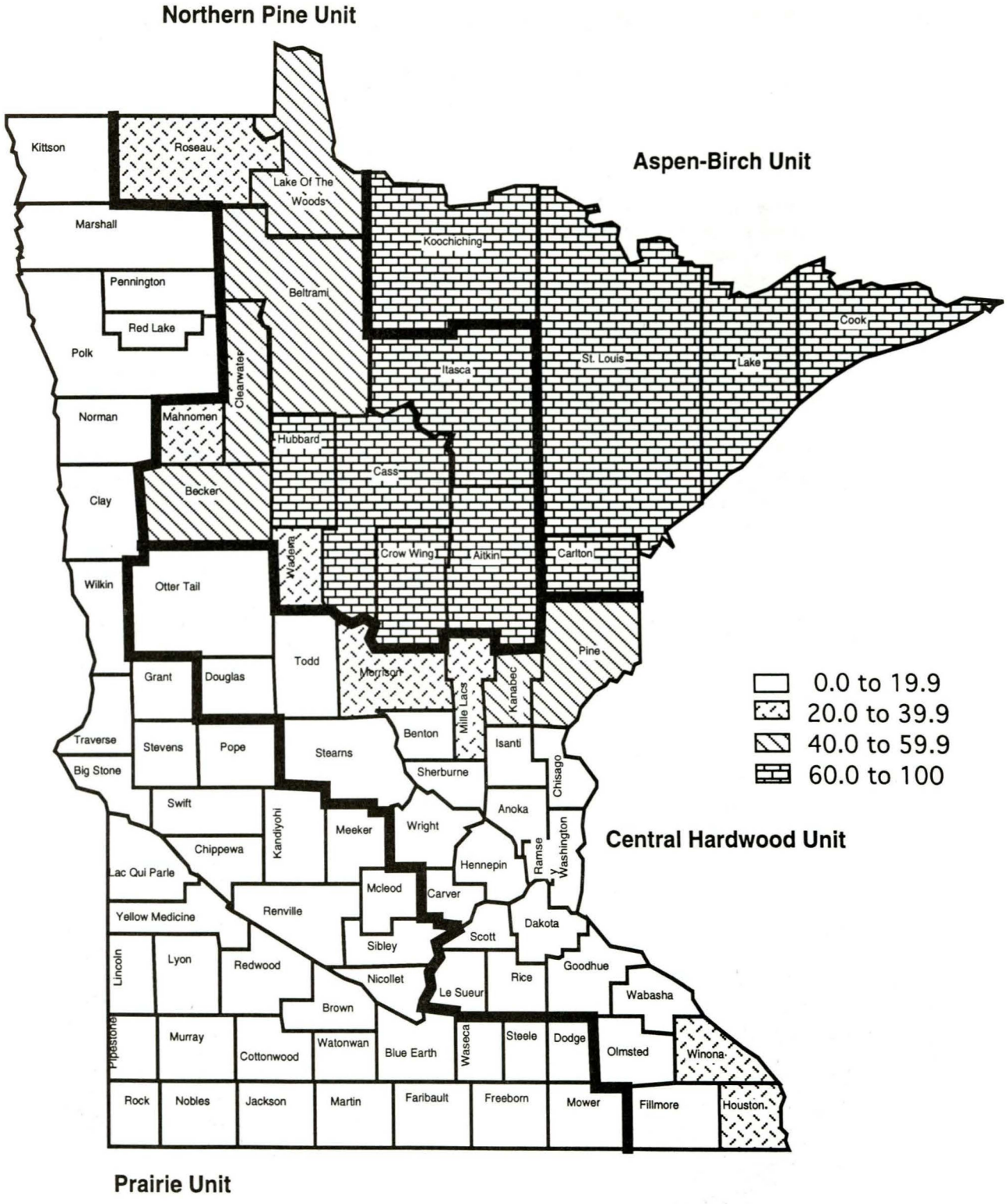


Figure 1.— *Forest land as a percent of land area by county, Minnesota, 1990.*

Aspen-Birch Unit is due mainly to these new site index curves. Another two-fifths of this increase can be attributed to the conversion of cropland or marshland to timberland.

- The highest concentration of timberland is in northeastern Minnesota (fig. 1). Of the four units, the Aspen-Birch Unit has the highest percentage of area in timberland (68 percent). The Northern Pine Unit is second with 53 percent timberland followed by the Central Hardwood Unit with 19 percent and the Prairie Unit with only 3 percent. The highest concentration of forest industry (pulp, saw, and fiberboard mills) is also in the north[1]. The Central Hardwood Unit, with 64 percent of the State's oak-hickory forest type, also plays an important role in the State's timber economy. Forest areas in the Prairie Unit are widely scattered but are important for recreation, wildlife, soil stabilization, and water quality.

- Private owners (individual, industry, corporate, and Indian) control 48.5 percent of the 14.7 million acres of timberland in Minnesota (fig. 2). State, county, and municipal governments administer 37.8 percent of the timberland in Minnesota.

[1] *Smith, W. Brad; Dahlman, Rick. 1988. Minnesota timber industry - an assessment of timber product output and use, 1988. Resour. Bull. NC-127. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 61 p.*

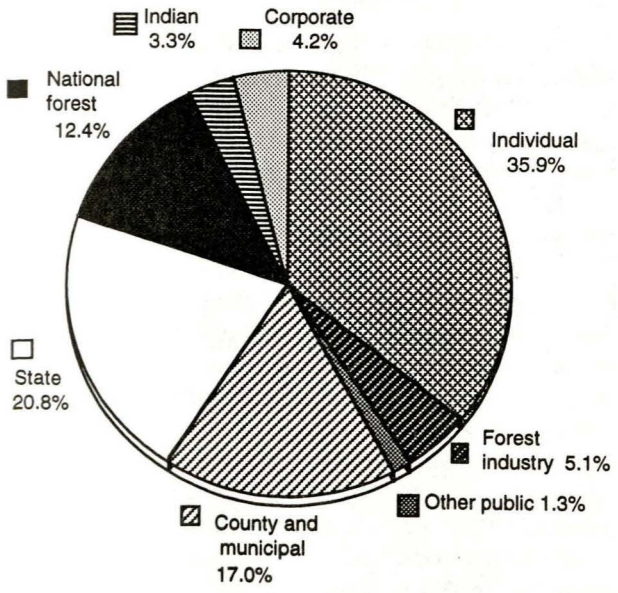


Figure 2.—*Distribution of timberland by ownership, Minnesota, 1990.*

- The area of sawtimber stands increased from 26 percent of the timberland area in 1977 to 33 percent in 1990 as poletimber stands grew into the sawtimber size class. The proportion of area in sapling-seedling stands also increased by approximately 7 percent, from 23 percent of timberland area in 1977 to 30 percent in 1990. This increase is attributable to the regeneration of former sawtimber and poletimber stands that had been harvested or disturbed by natural events.

- Stocking on timberland areas improved slightly between survey periods. In 1977 approximately 74 percent of timberland was moderately to well stocked. By 1990 this had increased to 78 percent.

- More than one-third of the timberland in Minnesota is in the aspen forest type (fig. 3), a proportion that remained relatively constant between the two surveys. The area in black spruce and northern white-cedar types increased by 25 percent, and the area of tamarack increased by more than 40 percent between inventories. These increases are due in large part to the reclassification of unproductive forest land to marginally productive timberland in 1990.

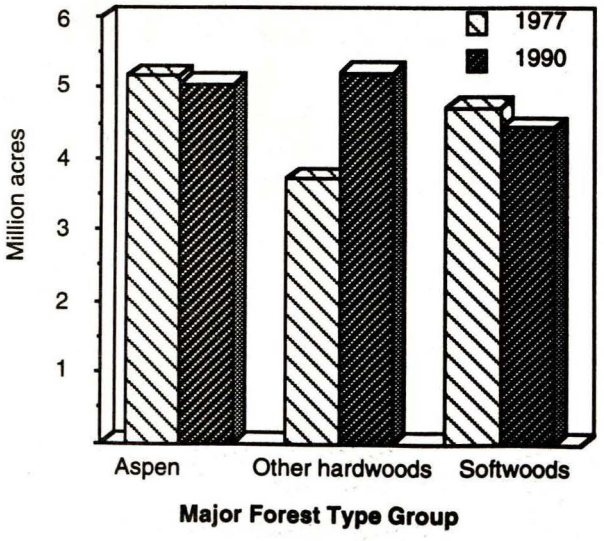


Figure 3.—*Area of timberland by major forest type group, Minnesota, 1977 and 1990.*

Number of Trees

- In 1990 there were more than 2 billion growing-stock trees 5 inches and larger in diameter in Minnesota, an increase of nearly 10 percent from that reported in 1977. The number of growing-stock trees between 1 and 5 inches in diameter increased by 26 percent between 1977 (4.4 billion) and 1990 (5.6 billion).

Volume

- Growing-stock volume increased from 12.4 billion cubic feet in 1977 to 15.1 billion cubic feet in 1990—a gain of 22 percent (fig. 4). During the same period, sawtimber volume increased from 24.4 billion board feet to 34.9 billion board feet, up 43 percent.

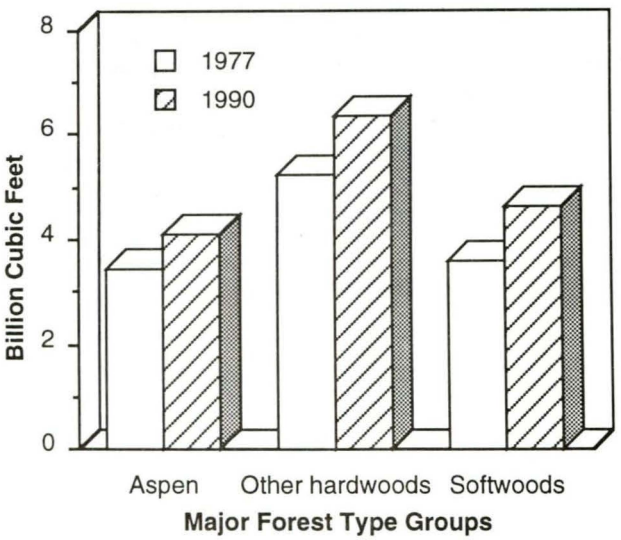


Figure 4.—*Growing-stock volume by major forest type groups, Minnesota, 1977 and 1990.*

- Growing-stock volume per acre increased from 909 cubic feet to 1,028 cubic feet between inventories. During the same period, sawtimber volume per acre increased from 1,795 to 2,371 board feet.

- Fifty-one percent of the growing-stock volume in Minnesota is on public lands (fig. 5). State and local governments administer 36 percent, and the Chippewa and Superior National Forests administer 14 percent. Private ownership of growing-stock volume is divided between individual (37 percent), forest industry (4 percent), corporate (4 percent), and Indian (4 percent).

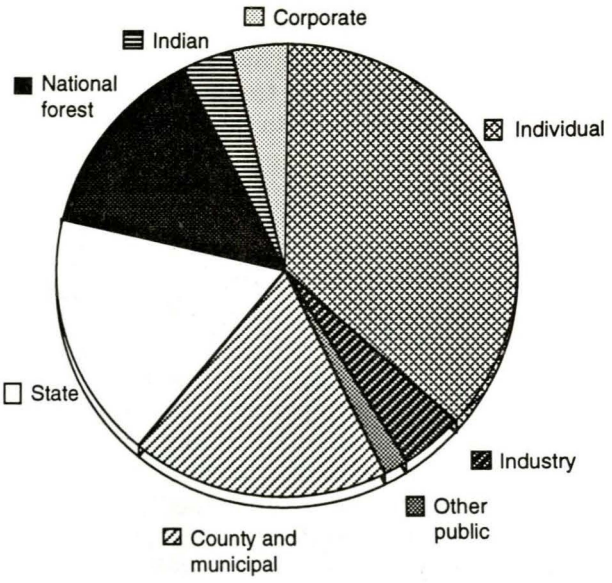


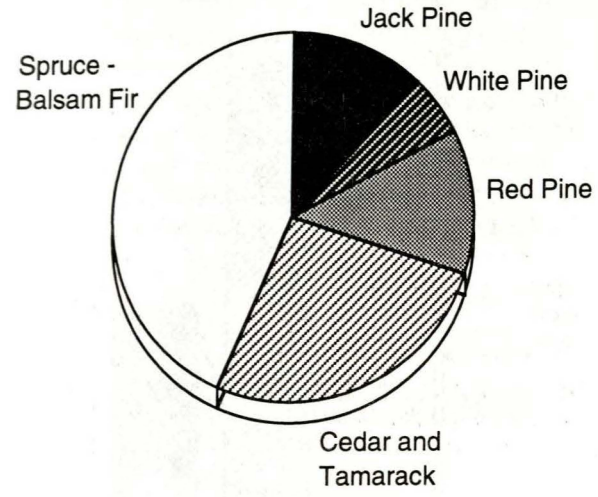
Figure 5.—*Growing-stock volume by ownership group, Minnesota, 1990.*

- Hardwoods comprise 69 percent of the growing-stock volume in Minnesota, or about 10.5 billion cubic feet. Aspen (quaking and bigtooth) is the largest component of hardwoods, totaling 4.1 billion cubic feet or 39 percent of hardwood volume (fig. 6). Softwoods account for the other 31 percent of total timber volume. Spruce and fir are the largest constituent at 43 percent of softwood volume.

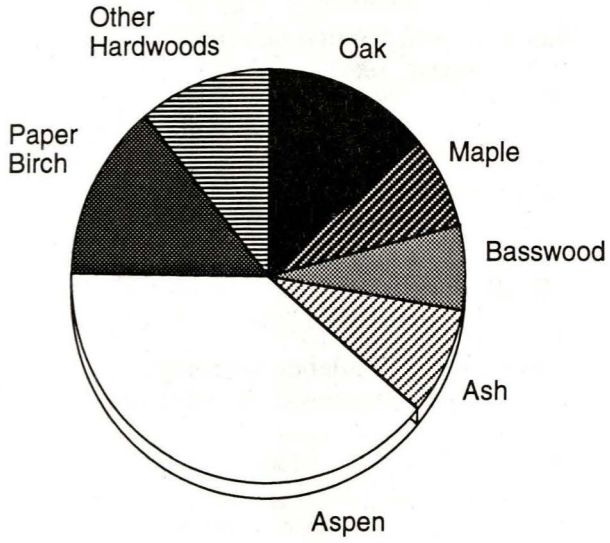
Timber Growth, Mortality, and Removals

- Net annual growth of growing stock on timberland averaged 369.8 million cubic feet per year between 1977 and 1989, an average of 25.1 cubic feet of growth per acre per year, or 2.4 percent of the 1990 inventory.

- Average net annual growth for softwoods was 113.6 million cubic feet during the period from 1977 to 1989, or 2.4 percent of the 1990 softwood inventory (fig. 7). Hardwood average net annual growth was 256.3 million cubic feet—2.4 percent of the 1990 hardwood inventory. Almost half of the hardwood growth was in aspen. Average annual growth of aspen was 124.2 million cubic feet, or 3.0 percent of the 1990 aspen inventory. The rest of the hardwoods had an average annual growth of 132.1 million cubic feet—2.1 percent of their 1990 inventory.



Softwoods: 4.6 Billion Cubic Feet



Hardwoods: 10.5 Billion Cubic Feet

Figure 6.—*Growing-stock volume by species group, Minnesota, 1990.*

- Growing-stock mortality on timberland averaged 220.8 million cubic feet per year from 1977 to 1989, an average of 1.5 percent of the 1990 inventory.

- Average annual removals of growing stock from timberland during the period from 1977 to 1989 were 210.1 million cubic feet. Softwood removals averaged 54.9 million cubic feet per year (48.4 percent of growth) (fig. 7). Average annual aspen removals were 85.8 million cubic feet (69.1 percent of growth) over this period. All other hardwood removals averaged 69.3 million cubic feet (52.5 percent of growth).

- Current annual growth of growing stock on timberland was 439.8 million cubic feet in 1989, 2.9 percent of the 1990 inventory. Current growth per acre for 1989 was 29.9 cubic feet, 19 percent higher than average annual growth.

- Total current annual removals of growing stock on timberland in 1988 amounted to 261.2 million cubic feet. Aspen removals in 1988 totaled 144.1 million cubic feet, or 8 percent more than current annual growth in 1989.

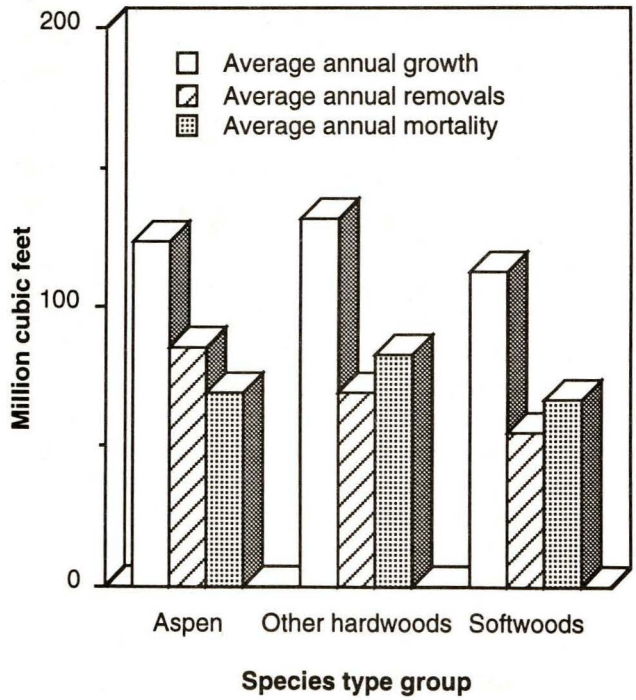


Figure 7.—*Average annual growth, removals, and mortality of growing stock on timberland by species type group, Minnesota, 1977-1989.*

Biomass

- All live tree biomass (trees at least 1 inch in diameter) on timberland averaged 60.1 green tons per acre in 1990. Seventy-one percent of the live tree biomass was in growing-stock trees. Cull trees accounted for 13.4 percent of the biomass, and trees between 1 and 5 inches in diameter accounted for the remaining 15.6 percent (fig. 8).

- The average biomass of tall and low shrubs (including trees less than 1 inch d.b.h.) in Minnesota was 3,056 pounds per acre green weight. Average biomass ranged from a high of 3,979 pounds per acre for the paper birch forest type to a low of 554 pounds per acre for the white pine forest type.

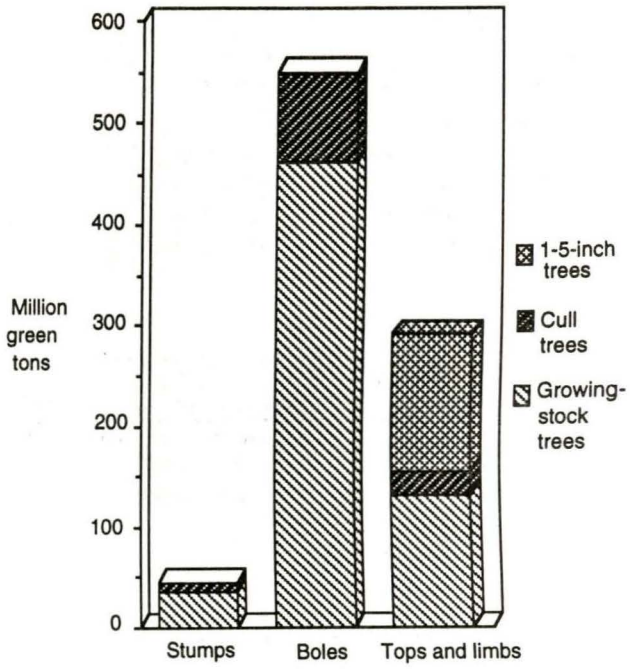


Figure 8.—*All live tree biomass by component, Minnesota, 1990.*

APPENDIX

ACCURACY OF THE SURVEY

Forest Inventory and Analysis information is based on a sampling procedure designed to provide reliable statistics at the State and Survey Unit levels. Consequently, the reported figures are estimates only. A measure of reliability of these figures is given by sampling errors. These sampling errors mean that the chances are two out of three that if a 100-percent inventory had been taken, using the same methods, the results would have been within the limits indicated.

For example, the estimated growing-stock volume in the State in 1990, 15,133.1 million cubic feet, has a sampling error of ±0.71 percent (±107.4 million cubic feet). The growing-stock volume from a 100-percent inventory would be expected to fall between 15,025.7 and 15,240.5 million cubic feet (15,133.1 ± 107.4), there being a one in three chance that this is not the case.

The following tabulation shows the sampling errors for the Minnesota Forest Inventory:

Item	State totals	Sampling error
Growing stock	(Million cubic feet)	(Percent)
Volume (1990)	15,133.1	0.71
Average annual growth (1977-1989)	369.8	1.30
Average annual removals (1977-1989)	210.1	4.86
Sawtimber	(Million board feet)	
Volume (1990)	34,906.5	1.02
Average annual growth (1977-1989)	1,312.2	1.45
Average annual removals (1977-1989)	515.4	6.03
Timberland area (1990)	(Thousand acres) 14,723.2	0.36

As survey data are broken down into sections smaller than State totals, the sampling error increases. For example, the sampling error for timberland area in a particular county is higher than that for total timberland area in the State. This tabulation shows the sampling errors for State totals. To estimate sampling error for data smaller than State totals, use the following formula:

$$E = \frac{(SE)\sqrt{\text{(State total volume or area)}}}{\sqrt{\text{(Volume or area smaller than State total)}}}$$

where:

E = sampling error in percent
SE = State total error for volume or area

For example, to compute the error on the area of timberland in the aspen type for the State, proceed as follows:

The total area of aspen type in the State from table 3 = 5,055,000 acres

The total area of all timberland in the State from table 3 = 14,723,200 acres

The State total error for timberland area from the above tabulation = 0.0036 percent

Using the above formula:

$$\text{Sampling Error} = \frac{(0.0036)\sqrt{14{,}723{,}200}}{\sqrt{5{,}055{,}000}}$$

$$= \pm 0.61 \text{ percent}$$

County Data

A standard FIA inventory is designed to provide sampling errors of no more than 3 percent per million acres of timberland or an overall error on Minnesota's nearly 15 million acres of about 0.8 percent. The State of Minnesota funded the collection of additional field data to reduce the sampling error by one-half. The overall goal was to provide a sampling error of less than 10 percent for total timberland area by county. This goal was achieved in the Aspen-Birch and Northern Pine Units and in most of the Central Hardwood Unit. It was not achieved in the Prairie Unit counties and in several counties in the Central Hardwood Unit. Sampling errors for area, volume, growth, and removals for both growing stock and sawtimber for each county in Minnesota are shown in table 79.

The sampling error within a county depends on county size and total area of timberland. Many large, heavily forested counties in the State have sampling errors well below 5 percent. However, in counties where timberland area is less than 35,000 acres, the sampling error for the total area in timberland will generally exceed 10 percent. The sampling error for total timber volume in a reporting area containing 35,000 acres of timberland will be about 20 percent. Individual county data for the Prairie and Central Hardwood Survey Units are provided in the following tabulation. All other tables reporting county level information use the county or county group names displayed below.

Unit	County	County grouping
Aspen-Birch	Carlton	(for Aspen-Birch and Northern Pine
	Cook	Units there are no county groupings
	Koochiching	
	Lake	
	St. Louis	
Northern Pine	Aitkin	
	Becker	
	Beltrami	
	Cass	
	Clearwater	
	Crow Wing	
	Hubbard	
	Itasca	
	Lake of the Woods	
	Mahnomen	
	Roseau	
	Wadena	
Central Hardwood	Anoka	Anoka-Dakota-Ramsey-Washington
	Benton	Benton-Sherburne
	Carver	Carver-Hennepin-Scott
	Chisago	Chisago-Isanti
	Dakota	Anoka-Dakota-Ramsey-Washington
	Douglas	Douglas-Todd
	Fillmore	Fillmore-Olmsted
	Goodhue	
	Hennepin	Carver-Hennepin-Scott
	Houston	
	Isanti	Chisago-Isanti
	Kanabec	
	Le Sueur	Le Sueur-Rice
	Mille Lacs	
	Morrison	
	Olmsted	Fillmore-Olmsted
	Otter Tail	
	Pine	
	Ramsey	Anoka-Dakota-Ramsey-Washington
	Rice	Le Sueur-Rice
	Scott	Carver-Hennepin-Scott
	Sherburne	Benton-Sherburne
	Stearns	
	Todd	Douglas-Todd
	Wabasha	
	Washington	Anoka-Dakota-Ramsey-Washington
	Winona	
	Wright	

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Unit	County	County grouping
Prairie	Big Stone	Western
	Blue Earth	Blue Earth-Faribault
	Brown	Southern
	Chippewa	Western
	Clay	Clay-Norman
	Cottonwood	Eastern
	Faribault	Blue Earth-Faribault
	Freeborn	Eastern
	Grant	Western
	Jackson	Southern
	Kandiyohi	Kandiyohi-Meeker
	Kittson	
	Lac qui Parle	Western
	Lincoln	Western
	Lyon	Western
	McLeod	Northern
	Marshall	
	Martin	Southern
	Meeker	Kandiyohi-Meeker
	Mower	Eastern
	Murray	Western
	Nicollet	Northern
	Nobles	Western
	Norman	Clay-Norman
	Pennington	Pennington-Red Lake
	Pipestone	Western
	Polk	
	Pope	Western
	Red Lake	Pennington-Red Lake
	Redwood	Southern
	Renville	Northern
	Rock	Western
	Sibley	Northern
	Steele	Eastern
	Stevens	Western
	Swift	Western
	Traverse	Western
	Waseca	Eastern
	Watonwan	Southern
	Wilkin	Western
	Yellow Medicine	Western

COMPARING MINNESOTA'S FIFTH INVENTORY WITH THE FOURTH INVENTORY

The following paragraphs highlight some of the procedural changes since the last inventory to assist the reader in analyzing data from this report:

A new volume estimation procedure was developed for the Lake States (see Survey Procedures section), and this procedure was used to compute the 1989 volumes and to recompute the 1977 volume for growth calculations. Although the adjustment will differ by Survey Unit and species, the recomputed 1977 growing-stock and board foot volumes will generally be greater than those published in the 1977 report.

Past surveys used only growing-stock trees to determine stand-size class. Current survey procedures require that stand-size class be determined on the basis of all live trees. Therefore, direct comparisons of current inventory data to old inventory data by stand-size class may be misleading.

The basic building block for estimating forest area and timber volume has been changed from the Survey Unit to the county. In the past, the statistics were developed at the Unit level and prorated back to the county on the basis of photo-interpreted points. Direct development of county-level data helps users interested in more precise local data, but can make the outcome of comparisons with past estimates uncertain.

SURVEY PROCEDURES

The 1990 Minnesota survey used a growth model-enhanced, two-phase sample design. Using this sampling scheme and associated estimators is similar to sampling with partial replacement (SPR), in that a set of randomly located plots is available for remeasurement and a random set of new plots is established and measured. A significant feature of the new Minnesota design is stratification for disturbance on the old sample and use of a growth model to improve regression estimates made on old undisturbed forest plots (fig. 9). Detailed descriptions of the sampling and estimation procedures are presented by Hansen (1990)[2]. The growth model used in the Minnesota survey design was the Lake States Stand and Tree Evaluation and Modeling System (STEMS)[3].

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[2] *Hansen, Mark H. 1990. A comprehensive sampling system for forest inventory based on an individual tree growth model. St. Paul, MN: University of Minnesota, College of Natural Resources. 256 p. Ph.D. dissertation.*

[3] *Belcher, David W.; Holdaway, Margaret R.; Brand, Gary J. 1982. A description of STEMS the stand and tree evaluation and modeling system. Gen. Tech. Rep. NC-79. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 18 p.*

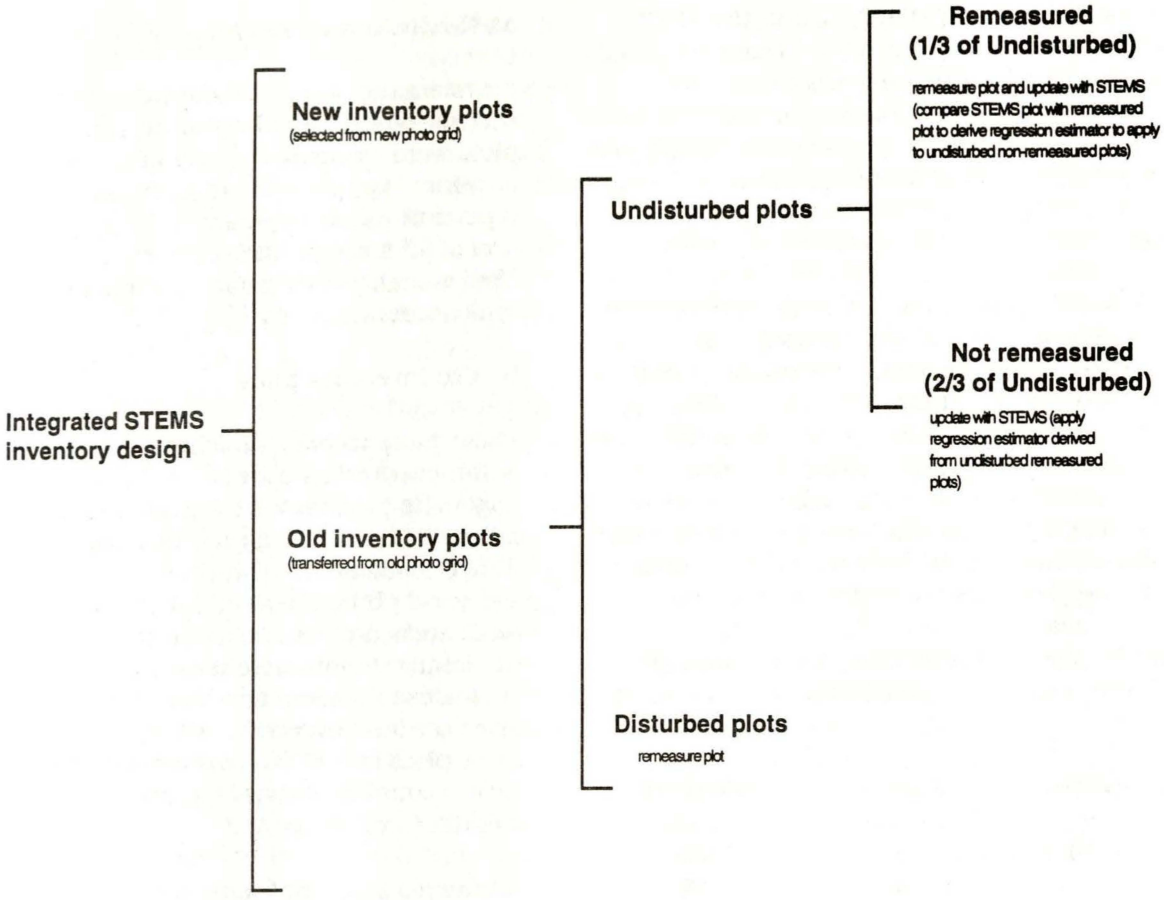
Integrated STEMS inventory design
New inventory plots
(selected from new photo grid)
Old inventory plots
(transferred from old photo grid)
Undisturbed plots
Disturbed plots
remeasure plot
Remeasured
(1/3 of Undisturbed)
remeasure plot and update with STEMS (compare STEMS plot with remeasured plot to derive regression estimator to apply to undisturbed non-remeasured plots)
Not remeasured
(2/3 of Undisturbed)
update with STEMS (apply regression estimator derived from undisturbed remeasured plots)

Figure 9.—*Overview of the Minnesota sample design.*

These were the major steps in the new survey design:

1. Aerial photography (Phase 1)

In this phase two sets of random points were located on current aerial photography. The first is a set of new photo plots and the second is a set of relocated old ground plot locations from the 1977 inventory. Photos used in the Aspen-Birch and Northern Pine Units were 1:58,000 scale color infrared National High Altitude Photo program (NHAP) prints purchased by the Minnesota Department of Natural Resources (DNR) from the U.S. Geological Survey. Aerial photos used in the Central Hardwood and Prairie Units were 1:40,000 black and white National Aerial Photography Program (NAPP) photos furnished by the Agricultural Stabilization and Conservation Service (ASCS). In addition, the DNR provided 35mm true color prints at a scale of 1:15,840 of all of the 1977 ground plot locations. These 35mm prints were used in addition to the NHAP prints to help detect disturbances in the 1977 ground plot locations. The dates of photography for each Unit in the State are provided below. Dates of photography for individual counties can be found in their respective Unit reports. Photo interpretation for the Aspen-Birch Unit and Northern Pine Unit was performed by the DNR. FIA photo interpreters classified the Central Hardwood and Prairie Units.

	Date	
Unit	**NHAP**	**35mm**
Aspen-Birch	1981-1984	1986-1987
Northern Pine	1981-1985	1985-1989
Central Hardwoods	1976-1984	1988
Prairie	1978-1982	1988

The locations of the plots used in the 1977 inventory were transferred to these new photographs. The photographs were then assembled into township mosaics, and a systematic grid of 121 one-acre photo plots (each plot representing approximately 190.4 acres) was overlaid on each township mosaic. Each of these photo plots was examined by aerial photogrammetrists and classified stereoscopically based on land use. If trees were present, forest type and stand-size/density class were recorded. All of the 1977 ground plot locations were also examined for disturbance (logging, fire, catastrophic mortality, etc.) with the aid of the 35mm photographs. After this examination, all the old "disturbed" sample locations and one-third of the old "undisturbed" forested plots were sent to the field for survey crews to verify the photo classification and to take further measurements. All photo plot locations for the 1990 inventory were examined and were classified as shown in the following tabulation:

Photo land class	Photo plots
Timberland	73,506
Reserved forest land	5,906
Other forest land	5,918
Questionable	2,876
Nonforest with trees	4,503
Nonforest without trees	174,934
Water	16,777
All classes	284,420

2. Plot measurements (Phase 2)

On plots classified as timberland, wooded pasture, or windbreak (at least 120 feet wide), a ground plot was established, remeasured, or modeled. Old plots sent to the field for remeasurement that could not be relocated were replaced with a new plot at the approximate location of the old one. Each ground plot consists of a 10-point cluster covering approximately 1 acre. At each point, trees 5.0 inches or more in d.b.h. were sampled on a 37.5 Basal Area Factor (BAF) variable-radius plot, and trees less than 5.0 inches d.b.h. were sampled on a 1/300-acre fixed-radius plot. The measurement procedures for the new and old sample locations were as follows:

a. New inventory plots

A systematic sample of the new photo plots was selected for field measurement. Ground plots were established, and measures of current classification such as land use, forest type, and ownership as well as size and condition of all trees on the plot were recorded. These locations were monumented for future remeasurement.

b. Old inventory plots

These plots were established, monumented, and measured as part of the 1977 field inventory. The procedures for these old plots were different from those for the new plots. Old plots were classed as "undisturbed" or "disturbed" in the aerial photo phase of the sampling process. All disturbed plots and a one-third sample of the undisturbed plots were remeasured to obtain estimates of current condition and changes since the last inventory. All trees measured on these plots in 1977 were remeasured or otherwise accounted for, and all new trees were identified and measured.

All sample plots that were forested at the time of the 1977 inventory and that were determined to be undisturbed at the time of the 1990 inventory were projected to 1990 using STEMS. This procedure gives projected estimates of current volume and growth for these undisturbed plots. The comparison of the projected and observed values on the one-third sample of the undisturbed forest plots that were remeasured provided local calibration data to adjust the projected values of the undisturbed plots that were not remeasured. The adjustment procedure is a modified version of the method described by Smith[4].

In the Aspen-Birch and Northern Pine Units, plots that were classified in Phase 1 as undisturbed nonforest were visually inspected from fixed wing aircraft to verify this classification. If the spotter felt the photo interpreter had misclassified the plot, the plot was ground checked by the field crew.

[4] *Smith, W. Brad. 1983. Adjusting the STEMS regional growth models to improve local predictions. Res. Note NC-297. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.*

The old sample plots that were not forested in 1977 and that were determined to be undisturbed until the current inventory (no evidence of conversion to another land use) were also sub-sampled (field checked) at the one-third rate. Any changes in land use to forest detected on these plots were used to adjust the two-thirds sample of these plots not field checked. The field check of these points in the Northern Pine Unit indicated that no adjustment was necessary.

The undisturbed forested plots that were not remeasured play a crucial role in the new survey design. These plots, after careful examination comparing past and current aerial photography, were determined to be undisturbed and had conditions that could be simulated by STEMS. The STEMS growth model was used to "grow" the old plot and tree data to produce an estimate of current data. Thus, these plots were treated as ground plots, even though they were never visited. The plot record for each modeled plot was sent to the field for verification of current ownership information.

All old plots classified as disturbed were sent to the field for remeasurement to assess and verify changes since the last inventory. Disturbance refers to any change on a plot that can be detected on aerial photos and that the STEMS growth processor cannot predict, such as catastrophic mortality, cutting, seedling stands, and land use change.

The estimation procedure for computing statistics from this sampling design was more complicated than the simple two-phase estimation procedure used in the past. In fact, this procedure yielded two independent samples, one coming from the new photo points and the other from the old photo points that are remeasured or modeled. The following tabulation summarizes the distribution of all ground plots for the new inventory design by type of plot:

3. Area estimates

Area estimates were made using two-phase estimation methods. In this type of estimation, a preliminary estimate of area by land use is made from the aerial photographs (Phase 1) and corrected by the plot measurements (Phase 2). A complete description of this estimation method is presented by Loetsch and Haller (1964)[5].

4. Volume estimates

Estimates of volume per acre were made from the trees measured or modeled on the 10-point plots. Estimates of volume per acre were multiplied by the area estimates to obtain estimates of total volume. Net cubic foot volumes are based on a modification of the method presented by Hahn (1984)[6] for use in the Lake States. For the Minnesota inventory, the merchantable height equation presented was used in conjunction with Stone's equation (see Appendix I in Hahn 1984) to estimate gross volume. This estimate was then corrected by species for variation in bark and cull volume to yield an estimate of net volume, using the coefficients presented in Hahn (1984).

The Forest Service reports all board foot volume in International 1/4-inch rule. In Minnesota, the Scribner log rule is commonly used. Scribner log rule conversion factors were derived from full tree measurements taken throughout the Lake States (Michigan,

[5] *Loetsch, F.; Haller, K.E. 1964. Forest inventory, volume I, statistics of forest inventory and information from aerial photographs. Vienna: BLV Verlagsgesellschaft Munch Basle. 436 p.*

[6] *Hahn, Jerold T. 1984. Tree volume and biomass equations for the Lake States. Res. Pap. NC-250. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 10 p.*

Ground land use class	Old plots remeasured	Old plots updated	New plots	Total plots
Timberland	6,430	2,962	2,726	12,118
Reserved forest land	27	20	630	677
Other forest land	250	424	149	823
Nonforest with trees	462	92	127	681
Nonforest without trees	8,357	14,994	3,991	27,342
Water	583	1,050	685	2,318
Total	16,109	19,542	8,308	43,959

Wisconsin, and Minnesota) and an equation developed by Wiant and Castenaeda (1977)[7]. The factors (multipliers) used to convert board foot International volumes to the Scribner rule are shown in the tabulation below:

D.b.h. (inches)	Scribner rule conversion factor	
	Softwoods	Hardwoods
9.0-10.9	0.7830	—
11.0-12.9	.8287	0.8317
13.0-14.9	.8577	.8611
15.0-16.9	.8784	.8827
17.0-18.9	.8945	.8999
19.0-20.9	.9079	.9132
21.0-22.9	.9168	.9239
23.0-24.9	.9240	.9325
25.0-26.9	.9299	.9396
27.0-28.9	.9321	.9454
29.0+	.9357	.9544

5. Growth and mortality estimates

On remeasured plots, estimates of growth and mortality per acre derive from the remeasured diameters of trees and from observation of trees that died between inventories. Growth reported as the average net annual growth between the two inventories (1977 and 1990) is computed from data on remeasurement plots and modeled plots using methods presented by VanDeusen *et al.* (1986)[8]. Mortality is also average annual for the remeasurement period. On new plots, where trees were not remeasured, estimates of growth and mortality were obtained by using STEMS to project the growth and mortality of trees for 1 year. Growth and mortality estimates for old undisturbed plots that were updated were derived in the same manner as remeasured plots. The STEMS growth model was adjusted by Survey Unit to meet local conditions, using data from the undisturbed remeasurement plots. As with volume, total growth and mortality estimates were obtained by multiplying the per acre estimates by area estimates. Current annual growth for 1989 was computed by using the adjusted STEMS model to grow all current inventory plots for 1 year.

6. Average annual removals estimates

Average annual growing-stock and sawtimber removals (1977 to 1989) were estimated only from the remeasured plots; new plots and STEMS-projected plots were not used to estimate removals. These estimates are obtained from trees measured in the last survey and cut or otherwise removed from the timberland base. Because remeasurement plots make up about one-half of the total ground plots, average annual removals estimates have greater sampling errors than volume and growth estimates.

Tree and Log Grade

Log grades and/or tree grades were assigned on approximately one-third of the sample plots in Minnesota. All sawtimber softwood sample trees were graded for quality and assigned a log grade. Log grades were also assigned to hardwood sawtimber trees in the Aspen-Birch and Northern Pine Units. Tree grades were assigned to hardwood sawtimber trees in the Prairie and Central Hardwood Units.

Log grades and tree grades are based on the classification of external characteristics as indicators of quality. The volume yield by log grade or tree grade for this sample was used to distribute the volume of the ungraded sample trees by species group. For example, in table 15, the volume in log grade 1 in the Aspen-Birch Unit (545,535 thousand board feet) represents all of the volume in that Unit in trees whose lowest log was given a log grade of 1.

Hardwood sawtimber trees in the Central Hardwood and Prairie Units were graded according to "Hardwood tree grades for factory lumber."[9] The best 12-foot section of the lowest 16-foot hardwood log was used for grading. Hardwood sawtimber trees that did not meet

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[7] *Wiant, Harry V., Jr.; Castenaeda, Froylan. 1977. Mesavage and Girard's volume tables formulated. BLM4. Denver, CO: U.S. Department of the Interior, Bureau of Land Management, Denver Service Center: 1-4.*

[8] *VanDeusen, P.C.; Dell, T.R.; Thomas, C.E. 1986. Volume growth estimation from permanent horizontal points. Forest Science. 32: 415-422.*

[9] *Hanks, Leland F. 1976. Hardwood tree grades for factory lumber. Res. Pap. NE-333. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 81 p.*

minimum tree grade specifications for grades 1 through 3 were assigned grade 4 according to Forest Service standard specifications for hardwood construction logs described in "A guide to hardwood log grading."[10]

Hardwood sawtimber trees in the Aspen-Birch and Central Hardwood Units were graded according to "A guide to hardwood log grading." The best 12-foot section of the lowest 16-foot hardwood log, or the best 12-foot upper section if the butt log did not meet minimum log-grade standards, was used for grading.

Red pine and jack pine sawtimber trees were graded based on specifications described in "Forest Service log grades for southern pines."[11] White pine and other softwood sawtimber trees were graded according to specifications described in "Saw log grades for eastern white pine,"[12] from the University of Wisconsin. For all softwoods, the first merchantable 16-foot log, or shorter lengths down to 12 feet, was used for grading.

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[10] *Rast, Everette D.; Sonderman, David L.; Gammon, Glenn L. 1973. A guide to hardwood log grading. Gen. Tech. Rep. NE-1. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 31 p.*

[11] *Campbell, Robert A. 1964. Forest Service log grades for southern pine. Res. Pap. SE-11. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 17 p.*

[12] *Ostrander, Myron D.; Brisbin, Robert L. 1971. Saw log grades for eastern white pine. Res. Pap. NE-205. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 24 p.*

Hardwood Tree Grades for Factory Lumber[a] (Used in Central Hardwood and Prairie Units)

Grade factor	Tree grade 1	Tree grade 2	Tree grade 3
Length of grading zone (feet)	Butt 16	Butt 16	Butt 16
Length of grading section [b] (feet)	Best 12	Best 12	Best 12
D.b.h., minimum (inches)	16[c]	13	11
Diameter, minimum inside bark at top of grading section (inches)	13[c] 16 20	11[d] 12	8
Clear cuttings (on the three best faces)[e]			
Length, minimum (feet)	7 5 3	3 3	2
Number on face (maximum)	2	2 3	f
Yield in face length (minimum)	5/6	4/6	3/6
Cull deduction (including crook and sweep, but excluding shake) maximum within grading section (percent)	9	9[g]	50

a *Hanks, Leland F. 1976. Hardwood tree grades for factory lumber. Res. Pap. NE-333. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 81 p.*

b *Whenever a 14- or 16-foot section of the butt 16-foot log is better than the best 12-foot section, the grade of the longer section will become the grade of the tree. This longer section, when used, is the basis for determining the grading factors such as diameter and cull deduction.*

c *In basswood and ash, d.i.b. at top of grading section must be 12 inches and d.b.h. must be 15 inches.*

d *Grade 2 trees can be 10 inches d.i.b. at top of grading section if they otherwise meet surface requirements for small grade 1's.*

e *A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth of the surface of the grading section as divided lengthwise.*

f *Unlimited.*

g *Fifteen percent crook and sweep or 40 percent total cull deduction are permitted in grade 2 trees, if size and surface of grading section qualify as grade 1. If rot shortens the required clear cuttings to the extent of dropping the butt log to grade 2, do not drop the tree's grade to 3 unless the cull deduction for rot is greater than 40 percent.*

Forest Service standard grades for hardwood factory saw logs[a]
(Used in Aspen-Birch and Northern Pine Units)

Grading factors		Log grades							
		Log grade 1			Log grade 2				Log grade 3
Position in tree		Butts only	Butts & uppers		Butts & uppers				Butts & uppers
Scaling diameter, inches		13-15[b]	16-19	20+	11+[c]	12+			8+
Length without trim, feet		10+			10+	8-9	10-11	12+	8+
Required clear cuttings[d] of each of three best faces[e]	Min. length, feet	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	No limit
	Min. proportion of log length required on clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Maximum sweep & crook allowance	For logs with less than 1/4 of end in sound defects	15%			30%				50%
	For logs with more than 1/4 of end in sound defects	10%			20%				35%
Max. scaling deduction		40%[f]			50%[g]				50%
End defect:	See special instructions in FPL-63.								

a *From USDA Forest Service Research Paper FPL-63.*
b *Ash and basswood butts can be 12 inches if they otherwise meet requirements* for small #1's.
c *Ten-inch logs of all species can be #2 if they otherwise meet requirements for small #1's.*
d *A clear cutting is a portion of a face, extending the width of the face, that is free of defects.*
e *A face is one-fourth of the surface of the log as divided lengthwise.*
f *Otherwise #1 logs with 41-60 percent deductions can be #2.*
g *Otherwise #2 logs with 51-60 percent deductions can be #3.*

Forest Service Standard Specifications for Hardwood Construction Logs (tie and timber logs)[1]

Position in tree	Butts and uppers
Min. diameter, small end	8 inches +
Min. length without trim	8 feet
Clear cuttings	No requirements
Sweep allowance	One-fourth of the diameter at the small end for each 8 feet of length.
Sound surface defects:	
Single knots	Any number, if no one knot has an average diameter above the callus in excess of one-third of the log diameter at point of occurrence.
Whorled knots	Any number, if the sum of knot diameters above the callus does not exceed one-third of the log diameter at point of occurrence.
Holes	Any number, provided none has a diameter over one-third of the log diameter at point of occurrence and none extends more than 3 inches into included timber[2].
Unsound surface defects :	Same requirements as for sound defects if they extend into included timber. No limit if they do not.

[1] *These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only nonfactory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, it may be necessary to subdivide the class into grades.*

[2] *Included timber is always square, and dimension is judged from small end.*

Eastern White Pine Saw Log Grade Specifications[a]

Grading factor	Log grade 1	Log grade 2	Log grade 3	Log grade 4
1. Minimum scaling diameter (inches)	14[b]	6	6	6
2. Minimum log length (feet)	10[c]	8	8	8
3. Maximum weevil injury (number)	None	None	2[d]	No limit
4. Minimum face requirements	Two full length or four 50%[e] length good faces (in addition, log knots on balance of faces shall not exceed size limit of grade 2 logs).	NO GOOD FACES REQUIRED Maximum diameter of log knots on three best faces: SOUND RED KNOTS not to exceed 1/6 scaling diameter and 3" maximum not to exceed 1/3 scaling diameter and 5" maximum OVERGROWN/DEAD/BLACK KNOTS not to exceed 1/12 scaling diameter and 1 1/2" max. not to exceed 1/6 scaling diameter and 2 1/2" max.		Includes all logs not qualifying for No. 3 or better and having at least 1/3 of their gross volume in sound wood suitable for manufacture into standard lumber
5. Maximum sweep or crook (%)	20	30	40	66 2/3
6. Maximum total scaling deduction (%)	50	50	50	66 2/3

AFTER THE TENTATIVE LOG GRADE IS ESTABLISHED FROM FACE EXAMINATION, THE LOG WILL BE REDUCED IN GRADE WHENEVER THE FOLLOWING DEFECTS ARE EVIDENT:

7. Conks, punk knots, and pine borer damage on bark surface [f].
   Degrade one grade if present on one face.
   Degrade two grades if present on two faces.
   Degrade three grades if present on three or more faces.

8. Log end defects: red rot, ring shake, heavy stain, and pine borer damage outside the heart center of log[e]. Consider log as having a total of 8 quarters (4 on each end) and degrade as indicated.
   Degrade one grade if present in 2 quarters of log ends.
   Degrade two grades if present in 3 or 4 quarters of log ends.
   Degrade three grades if present in 5 or more quarters of log ends.

[a] Ostrander, Myron D.; Brisbin, Robert L. 1971. Saw log grades for eastern white pine. Res. Pap. NE-205. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 24 p.

[b] 12- and 13-inch logs with four full-length good faces are acceptable.

[c] 8-foot logs with four full-length good faces are acceptable.

[d] 8-foot Number 3 logs limited to one weevil injury.

[e] Minimum 50% length good face must be at least 6 feet.

[f] Factors 7 and 8 are not cumulative (total degrade based on more serious of the two). No log is to be degraded below grade 4 if net scale is at least one-third of gross scale.

Log Grades for Jack Pine and Red Pine

Grade 1: Trees with three or four clear faces on the 16-foot grading section.[1]
Grade 2: Trees with one or two clear faces on the 16-foot grading section.
Grade 3: Trees with no clear faces on the 16-foot grading section.

After the tentative grade is established from above, the tree will be reduced one grade for each of the following, except that no tree can be reduced below grade 3, provided the total scaling deductions for sweep and/or rot do not exceed two-thirds of the gross scale of the tree.

1. *Sweep.* Degrade any tentative grade 1 or 2 tree one grade if sweep in the lower 12 feet of grading sections amounts to 3 or more inches and equals or exceeds one-fourth of the diameter at breast height.

2. *Heart rot.* Degrade any tentative grade 1 or 2 tree one grade if conk, punk knots, massed hyphae, or other evidence of advanced heart rot is found anywhere on the main tree stem.

[1] *A face is one-fourth of the circumference in width extending full length of the grading section. Clear faces are those free of: knots measuring more than one-half inch in diameter, overgrown knots of any size, and holes more than one-fourth inch in diameter. Faces may be rotated to obtain the maximum number of clear on the grading section.*

Log Grades for All Other Softwood Logs

Grade 1

1. Trees must be 16 inches in diameter or larger, grading section 12 feet in length or longer, and with deduction for defect not over 30 percent of gross scale.
2. Trees must be at least 75 percent clear on each of three faces.
3. All knots outside clear cutting must be sound and not more than 2-1/2 inches in size.

Grade 2

1. Trees must be 12 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross scale deducted for defect.
2. Trees must be at least 50 percent clear on each of three faces or 75 percent clear on two faces.

Grade 3

1. Trees must be 6 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross contents of the log.

Note: A) Diameters are diameter inside bark (DIB) at small end of grading section.
B) Percent clear refers to percent clear in one continuous section.

METRIC EQUIVALENTS OF UNITS USED IN THIS REPORT

1 acre = 4,046.86 square meters or 0.405 hectare.
1,000 acres = 405 hectares.
1 cubic foot = 0.0283 cubic meter.
1 foot = 30.48 centimeters or 0.3048 meter.
1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.
1 pound = 0.454 kilograms.
1 ton = 0.907 metric tons.

TREE SPECIES GROUPS IN MINNESOTA[13]

SOFTWOODS

Eastern white pine ..... *Pinus strobus*
Red pine ..... *Pinus resinosa*
Jack pine ..... *Pinus banksiana*
White spruce ..... *Picea glauca*
Black spruce ..... *Picea mariana*
Balsam fir ..... *Abies balsamea*
Tamarack ..... *Larix laricina*
Northern white-cedar ..... *Thuja occidentalis*
Other softwoods:
  Eastern redcedar ..... *Juniperus virginiana*
  Scotch pine ..... *Pinus sylvestris*
  Ponderosa pine ..... *Pinus ponderosa*

HARDWOODS

Select white oaks[14]
  White oak ..... *Quercus alba*
  Bur oak ..... *Quercus macrocarpa*
  Swamp white oak ..... *Quercus bicolor*
Select red oaks[14]
  Northern red oak ..... *Quercus rubra*
Other red oaks
  Northern pin oak ..... *Quercus ellipsoidalis*
  Black oak ..... *Quercus velutina*
Hickories[14]
  Shagbark hickory ..... *Carya ovata*
  Bitternut hickory ..... *Carya cordiformis*
Hard maples[14]
  Black maple ..... *Acer nigrum*
  Sugar maple ..... *Acer saccharum*
Soft maples[15]
  Red maple ..... *Acer rubrum*
  Silver maple ..... *Acer saccharinum*
Ashes
  White ash[14] ..... *Fraxinus americana*
  Black ash[15] ..... *Fraxinus nigra*
  Green ash[14] ..... *Fraxinus pennsylvanica*
Balsam poplar[15] ..... *Populus balsamifera*
Aspens[15]
  Bigtooth aspen ..... *Populus grandidentata*
  Quaking aspen ..... *Populus tremuloides*
Cottonwood[15] ..... *Populus deltoides*
Basswood[15] ..... *Tilia americana*
Black walnut[14] ..... *Juglans nigra*
Black cherry[15] ..... *Prunus serotina*
Butternut[15] ..... *Juglans cinerea*
Elms
  American elm[15] ..... *Ulmus americana*
  Siberian elm[15] ..... *Ulmus pumila*
  Slippery elm[15] ..... *Ulmus rubra*
  Rock elm[14] ..... *Ulmus thomasii*
Birches[15]
  Yellow birch ..... *Betula alleghaniensis*
  Paper birch ..... *Betula papyrifera*
Hackberry[15] ..... *Celtis occidentalis*
Black willow[15] ..... *Salix nigra*
Other hardwoods
  Boxelder[15] ..... *Acer negundo*
  Black locust[14] ..... *Robinia pseudoacacia*
  Red mulberry[15] ..... *Morus rubra*
  Kentucky coffeetree ..... *Gymnocladus dioicus*
  River birch ..... *Betula nigra*
Noncommercial species
  Striped maple ..... *Acer pensylvanicum*
  Mountain maple ..... *Acer spicatum*
  Ailanthus ..... *Ailanthus altissima*
  American hornbeam ..... *Carpinus caroliniana*
  Hawthorn ..... *Crataegus* spp.
  Apple ..... *Malus* spp.
  Eastern hophornbeam ..... *Ostrya virginiana*
  Pincherry ..... *Prunus pensylvanica*
  Wild plum ..... *Prunus* spp.
  Chokecherry ..... *Prunus virginiana*
  Peachleaf willow ..... *Salix amygdaloides*
  American mountain ash ... *Sorbus americana*

[13] *The common and scientific names are based on: Little, Elbert L. 1981. Checklist of native and naturalized trees of the United States. Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 385 p.*

[14] *This species or species group is considered a hard hardwood, with an average specific gravity greater than or equal to 0.50.*

[15] *This species or species group is considered a soft hardwood, with an average specific gravity of less than 0.50.*

DEFINITION OF TERMS

Average annual mortality of growing stock.—The average cubic foot volume of sound wood in growing-stock trees that died in one year. Average annual mortality is reported for a period of several years (1977 to 1990 in this report).

Average annual mortality of sawtimber.—The average board foot volume of sound wood in sawtimber trees that died in one year. Average annual mortality is reported for a period of several years (1977 to 1990 in this report).

Average annual removals from growing stock.—The average net growing-stock volume in growing-stock trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals. Average annual removals of growing stock are reported for a period of several years (1977 to 1989 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Average annual removals from sawtimber.—The average net board foot sawtimber volume of live sawtimber trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals. Average annual removals of sawtimber are reported for a period of several years (1977 to 1989 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Average net annual growth of growing stock.—The annual change in cubic foot volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes.

Average net annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes.

Basal area.—Tree area in square feet of the cross section at breast height of a single tree. When the basal areas of all trees in a stand are summed, the result is usually expressed as square feet of basal area per acre.

Biomass.—The aboveground volume of all live trees (including bark but excluding foliage) reported in green tons. Biomass has four components:

Bole.—Biomass of a tree from 1 foot above he ground to a 4-inch top outside bark.

Tops and limbs.—Total biomass of a tree from a 1-foot stump minus the bole.

1- to 5-inch trees.—Total aboveground biomass of a tree from 1 to 5 inches in diameter at breast height.

Stump.—Biomass of a tree 5 inches d.b.h. and larger from the ground to a height of 1 foot.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality, such as hophornbeam, osage-orange, and redbud.)

Cord.—One standard cord is 128 cubic feet of stacked wood, including bark and air space. Cubic feet can be converted to standard cords by dividing by 79.

Corporate.—Lands owned by a private corporation not in the business of operating primary wood-using plants.

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cropland.—Land under cultivation within the last 24 months; including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, form, missing or dead material, or other defect.

Current annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes. Current growth is based on an estimate of the current annual increment of each growing stock tree in the inventory, and is reported for a single year—1989 in this report.

Current annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes. Current growth is based on an estimate of the current annual increment of each growing stock tree in the inventory, and is reported for a single year—1989 in this report.

Current annual removals from growing stock.—The current net growing-stock volume in growing-stock trees removed annually for

roundwood forest products, in addition to the volume in logging residues and the volume in other removals. Current annual removals of growing stock are reported for a single year (1988 in this report) and are based on a survey of primary wood processing mills to determine removals for products, and on information from remeasurement plots (see Survey Procedures in Appendix) to determine removals due to land use change.

Current annual removals from sawtimber.—The current net board foot sawtimber volume of live sawtimber trees removed annually for roundwood forest products, in addition to the volume in logging residues, and the volume in other removals. Current annual removals of sawtimber are reported for a single year (1988 in this report) and are based on a survey of primary wood processing mills to determine removals for products and on information from remeasure-ment plots (see Survey Procedures in Appendix) to determine removals due to land use change.

Diameter class.—A classification of trees based on diameter outside bark, measured at breast height (d.b.h.) 4.5 feet above the ground. Two-inch diameter classes are commonly used in Forest Inventory and Analysis, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet (1.37m) above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Farm.—Any place from which $1,000 or more of agricultural products were produced and sold during the year.

Farmer-owned land.—(See Individual private land.)

Forest industry land.—Land owned by companies or individuals that operate a primary wood-using plant.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. (See Tree, Land, Timberland, Reserved forest land, Other forest land, Stocking, and Water.)

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. Major forest types in the State are:

Jack pine.—Forests in which jack pine comprises a plurality of the stocking. (Common associates include eastern white pine, red pine, aspen, birch, and maple.)

Red pine.—Forests in which red pine comprises a plurality of the stocking. (Common associates include eastern white pine, jack pine, aspen, birch, and maple.)

White pine.—Forests in which eastern white pine comprises a plurality of the stocking. (Common associates include red pine, jack pine, aspen, birch, and maple.)

Balsam fir.—Forests in which balsam fir and white spruce comprise a plurality of stocking with balsam fir the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

White spruce.—Forests in which white spruce and balsam fir comprise a plurality of the stocking with white spruce the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

Black spruce.—Forests in which swamp conifers comprise a plurality of the stocking with black spruce the most common. (Common associates include tamarack and northern white-cedar.)

Northern white-cedar.—Forests in which swamp conifers comprise a plurality of the stocking with northern white-cedar the most common. (Common associates include tamarack and black spruce.)

Tamarack.—Forests in which swamp conifers comprise a plurality of the stocking with tamarack the most common. (Common associates include black spruce and northern white-cedar.)

Oak-hickory.—Forests in which northern red oak, white oak, bur oak, or hickories, singly or in combination, comprise a plurality of the stocking. (Common associates include jack pine, elm, and maple.)

Elm-ash-soft maple.—Forests in which lowland elm, ash, red maple, silver maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. (Common associates include birches, spruce, and balsam fir.)

Maple-basswood.—Forests in which sugar maple, basswood, yellow birch, upland American elm, and red maple, singly or in combination, comprise a plurality of the stocking. (Common associates include white pine, elm, and basswood.)

Aspen.—Forests in which quaking aspen or bigtooth aspen, singly or in combination, comprise a plurality of the stocking. (Common associates include balsam poplar, balsam fir, and paper birch.)

Paper birch.—Forests in which paper birch comprises a plurality of the stocking. (Common associates include maple, aspen, and balsam fir.)

Balsam poplar.—Forests in which balsam poplar comprises a plurality of the stocking. (Common associates include aspen, elm, and ash.)

Growing-stock tree.—A live tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs.

Hard hardwoods.—Hardwood species with an average specific gravity greater than 0.50, such as oaks, hard maple, hickories, and ash.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. (See Soft hardwoods and Hard hardwoods.)

Improved pasture.—Land currently improved for grazing by cultivating, seeding, irrigating, or clearing trees or brush and less than 16.7 percent stocked with trees.

Indian land.—Land held in trust by the United States for tribes or individual Indians.

Individual private land.—Privately owned land excluding land owned by forest industry. This class includes the Farmer class and Miscellaneous private class.

Industrial wood.—All roundwood products except residential fuelwood.

Land.—(a) *Bureau of the Census.* Dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

(b) *Forest Inventory and Analysis.* The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Live trees.—Growing-stock, rough, and rotten trees 1.0 inch d.b.h. and larger.

Log grade.—A log classification based on external characteristics as indicators of quality or value. (See Appendix for specific grading factors used.)

Logging residue.—The unused portions of trees cut or killed by logging.

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation, and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw-log section that meets pulpwood or saw-log specifications, respectively.

Miscellaneous Federal land.—Federal land other than National Forest and land administered by the Bureau of Land Management or Bureau of Indian Affairs.

Miscellaneous private land.—(See Individual private land.)

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

a. *Nonforest land without trees*.—Nonforest land with no live trees present.

b. *Nonforest land with trees*.—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Forest land less than 16.7 percent stocked with all live trees.

Other forest land.—Forest land not capable of producing 20 cubic feet per acre per year of industrial wood crops under natural conditions and not associated with urban or rural development. Many of these sites contain tree species that are not currently utilized for industrial wood production or trees of poor form, small size, or inferior quality that are unfit for industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber utilization.

Other removals.—Growing-stock trees removed but not utilized for products, or trees left standing but "removed" from the timberland classification by land use change. Examples are removals from cultural operations such as timber stand improvement work, land clearing, and changes in land use.

Ownership size class.—The amount of timberland owned by one owner, regardless of the number of parcels.

Ownership tenure.—The length of time a property has been held by the owner.

Pasture.—Land presently used for grazing or under cultivation to develop grazing.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence. Example: sandy jack pine plains.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.—Deep, well-drained soils. Growth and species occurrence are limited only by climate. Example: well-drained terraces of loamy soil.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: moderately drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms and black spruce swamps.

Plant byproducts.—Plant residues used for products such as mulch, pulp chips, and fuelwood.

Plant residues.—Wood and bark materials generated at manufacturing plants during production of other products.

Plantation.—An artificially reforested area sufficiently productive to qualify as timberland. The planted species is not necessarily predominant. Christmas tree plantations, which are considered reserved forest land, are not included.

Poletimber stand.—(See Stand-size class.)

Poletimber tree.—A tree of commercial species at least 5.0 inches d.b.h. but smaller than sawtimber size.

Potential productivity class.—A classification of forest lands in terms of inherent capacity to grow crops of industrial wood. The class

identifies the potential growth in merchantable cubic feet/acre/year at culmination of mean annual increment of fully stocked natural stands.

Reserved forest land.—Forest land withdrawn from timber utilization through statute, administrative regulation, designation, or exclusive use for Christmas tree production, as indicated by annual shearing.

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull. May include noncommercial tree species.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. May include noncommercial tree species.

Roundwood products.—Logs, bolts, or other round sections (including chips from roundwood) cut from trees for industrial or consumer uses. (Note: Includes saw logs, veneer logs, and bolts; cooperage logs and bolts; pulpwood; fuelwood; pilings; poles; posts; hewn ties; mine timbers; and various other round, split, or hewn products.)

Salvable dead tree.—A standing or down dead tree considered merchantable by regional standards.

Sapling.—A live tree 1.0 to 5.0 inches d.b.h.

Sapling-seedling stand.—(See Stand-size class.)

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter outside bark (d.o.b.) for softwoods of 7.0 inches (9.0 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand.—(See Stand-size class.)

Sawtimber tree.—A tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified otherwise) from stump to a minimum 7 inches top diameter outside bark (d.o.b.) for softwoods and a minimum 9 inches top d.o.b. for hardwoods.

Seedling.—A live tree less than 1.0 inch d.b.h. that is expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—Sawtimber-size trees of commercial species that contain at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Shrub.—A woody, perennial plant differing from a perennial herb in its persistent and woody stem(s), and less definitely from a tree in its lower stature and/or the general absence of a well-defined main stem. For this report, shrubs were separated somewhat arbitrarily into tall and low shrubs as follows:

Tall shrubs.—Shrubs normally taller than 1.6 to 3.2 feet (0.5 to 1.0 meters).

Low shrubs.—Shrubs normally shorter than 1.6 to 3.2 feet. (Woody perennial vines, such as grape, were included with the low shrubs.)

Shrub and tree seedling biomass.—The total aboveground weight of trees less than 1.0 inch in diameter and all shrubs.

Site index.—An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Soft hardwoods.—Hardwood species with an average specific gravity less than 0.50 such as cottonwood, red maple, basswood, and willow.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—A classification based on age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-size class.—A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

a. *Sawtimber stands.*—Stands with half or more of live tree stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

b. *Poletimber stands.*—Stands with half or more live tree stocking in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

c. *Sapling-seedling stands.*—Stands with more than half of the live tree stocking in saplings and/or seedlings.

State land.—Land owned by the State of Minnesota or leased to it for 50 years or more.

Stocking.—The degree of occupancy of land by live trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

A stocking percent of 100 indicates full utilization of the site and is equivalent to 80 square feet of basal area per acre in trees 5.0 inches d.b.h. and larger. In a stand of trees less than 5 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5 inches d.b.h.

Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of live trees is 133 percent or more.

Fully stocked stands.—Stands in which stocking of live trees is from 100.0 to 132.9 percent.

Medium stocked stands.—Stands in which stocking of live trees is from 60.0 to 99.9 percent.

Poorly stocked stands.—Stands in which stocking of live trees is from 16.7 to 59.9 percent.

Nonstocked areas.—Timberland on which stocking of live trees is less than 16.7 percent.

Timber products output.—All timber products cut from roundwood and byproducts of wood manufacturing plants. Roundwood products include logs, bolts, or other round sections cut from growing-stock trees, cull trees, salvable dead trees, trees on nonforest land, noncommercial species, sapling-size trees, and limbwood. Byproducts from primary manufacturing plants include slabs, edging, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and screenings of pulpmills that are used as pulpwood chips or other products.

Timberland.—Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber utilization, and that is not associated with urban or rural development. Currently inaccessible and inoperable areas are included.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Tree biomass.—The total aboveground weight (including the bark but excluding the foliage) of all trees from 1 to 5 inches in d.b.h., and the total aboveground weight (including the bark but excluding the foliage) from a 1-foot stump for trees more than 5 inches in diameter.

Tree grade.—A tree classification based on external characteristics as indicators of quality or value, used for hardwood species. (See Appendix for specific grading factors used.)

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns; suburban areas developed for residential, industrial, or recreational purposes; schoolyards, cemeteries, roads; railroads; airports; beaches; powerlines; and other rights-of-way; or other nonforest land not included in any other specified land use class.

Urban forest land.—Land that would otherwise meet the criteria for timberland, but is in an urban-suburban area surrounded by commercial, industrial, or residential development and not likely to be managed for the production of industrial wood products on a continuing basis. Wood removed would be for land clearing, fuelwood, or esthetic purposes. Such forest land may be associated with industrial, commercial, residential subdivision, industrial parks, golf course perimeters, airport buffer strips, and public urban parks that qualify as forest land.

Water.—*(a) Bureau of the Census.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds at least 40 acres in area; and streams, sloughs, estuaries, and canals at least one-eighth of a statute mile wide.

(b) Noncensus.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds from 1 to 39.9 acres in area; and streams, sloughs, estuaries, and canals from 120 feet to one-eighth of a statute mile wide.

Wooded pasture.—Improved pasture with more than 16.7 percent stocking in live trees, but less than 25 percent stocking in growing-stock trees. Area is currently improved for grazing or there is other evidence of grazing.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

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Table 72.—Timber products from roundwood by species group and product, Minnesota, 1988

Table 73.—Volume of primary plant residue by use and type of wood residue, and softwoods and hardwoods, Minnesota, 1988

Biomass

Table 74.—All live tree biomass yields on timberland by species group and forest type, Minnesota, 1990

Table 75.—All live tree biomass on timberland by species group and forest type, Minnesota, 1990

Table 76.—All live tree biomass on timberland by species group and tree biomass component (in green tons), Minnesota, 1990

Table 77.—All live tree biomass on timberland by species group and tree biomass component (in thousand cubic feet), Minnesota, 1990

Table 78.—All live shrub and tree seedling biomass yields on timberland by species group and forest type, Minnesota, 1990

Sampling Error

Table 79.—Sampling errors for Forest Survey Unit and county totals of area of timberland, volume, average net annual growth, and average annual removals on timberland, Minnesota, 1990

Table 1. -- Area of land by Forest Survey Unit, county, and major land-use class, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	Total[1] land area	Forest land				Other[2] land
		Total forest	Timberland	Reserved forest land	Other forest land	
Aspen-Birch Unit						
Carlton	552.8	352.6	340.5	6.9	5.2	200.2
Cook	903.8	854.9	565.4	286.6	2.9	48.9
Koochiching	1,989.1	1,732.8	1,423.9	21.2	287.7	256.3
Lake	1,313.7	1,199.1	850.1	329.8	19.2	114.6
St. Louis	3,919.9	3,223.7	2,698.8	359.9	165.0	696.2
Total	8,679.3	7,363.1	5,878.7	1,004.4	480.0	1,316.2
Northern Pine Unit						
Aitkin	1,173.6	754.2	700.5	1.0	52.7	419.4
Becker	839.7	335.3	332.3	3.0	-	504.4
Beltrami	1,604.5	928.5	835.6	2.9	90.0	676.0
Cass	1,301.2	868.6	841.6	1.6	25.4	432.6
Clearwater	639.7	318.0	285.2	18.7	14.1	321.7
Crow Wing	644.8	387.9	385.7	-	2.2	256.9
Hubbard	598.8	407.9	399.8	5.9	2.2	190.9
Itasca	1,703.4	1,361.4	1,323.4	0.8	37.2	342.0
Lake of the Woods	829.6	495.7	391.5	-	104.2	333.9
Mahnomen	357.8	114.8	112.1	1.6	1.1	243.0
Roseau	1,073.3	225.7	217.2	-	8.5	847.6
Wadena	344.1	119.1	119.1	-	-	225.0
Total	11,110.5	6,317.1	5,944.0	35.5	337.6	4,793.4
Central Hardwood Unit						
Anoka-Dakota-Ramsey-Washington	990.6	83.8	70.4	10.3	3.1	906.8
Benton-Sherburne	539.5	88.1	85.4	0.8	1.9	451.4
Carver-Hennepin-Scott	799.4	50.6	44.9	5.7	-	748.8
Chisago-Isanti	548.5	102.7	101.6	1.1	-	445.8
Douglas-Todd	1,014.2	128.5	128.1	0.4	-	885.7
Fillmore-Olmsted	970.7	142.3	139.3	3.0	-	828.4
Goodhue	488.3	68.8	68.8	-	-	419.5
Houston	361.0	135.7	133.9	-	1.8	225.3
Kanabec	337.5	139.8	139.8	-	-	197.7
Le Sueur-Rice	606.2	42.1	42.1	-	-	563.9
Mille Lacs	369.9	145.2	138.4	5.9	0.9	224.7
Morrison	719.2	167.4	166.4	1.0	-	551.8
Otter Tail	1,262.8	218.2	208.2	4.5	5.5	1,044.6
Pine	909.5	520.7	486.4	33.7	0.6	388.8
Stearns	856.4	69.2	69.2	-	-	787.2
Wabasha	343.6	67.9	67.9	-	-	275.7
Winona	403.3	129.1	126.6	2.5	-	274.2
Wright	430.1	44.1	43.3	0.8	-	386.0
Total	11,950.7	2,344.2	2,260.7	69.7	13.8	9,606.3

(Table 1 continued on next page)

(Table 1 continued)

Forest Survey Unit and county	Total[1] land area	Forest land				Other[2] land
		Total forest	Timberland	Reserved forest land	Other forest land	
Prairie Unit						
Blue Earth-Fairbault	936.8	46.5	46.5	-	-	890.3
Clay-Norman	1,232.3	48.4	48.4	-	-	1,183.9
Eastern Group[3]	1,733.7	46.0	45.4	0.6	-	1,687.7
Kandiyohi-Meeker	901.2	43.4	42.0	1.4	-	857.8
Kittson	706.6	72.1	65.1	2.8	4.2	634.5
Marshall	1,126.5	137.1	133.3	-	3.8	989.4
Northern Group[4]	1,604.3	50.4	49.0	1.4	-	1,553.9
Pennington-Red Lake	672.3	62.1	62.1	-	-	610.2
Polk	1,268.2	59.6	58.5	-	1.1	1,208.6
Southern Group[5]	2,541.8	36.4	36.4	-	-	2,505.4
Western Group[6]	6,446.7	54.5	53.1	1.4	-	6,392.2
Total	19,170.4	656.5	639.8	7.6	9.1	18,513.9
All counties	50,910.9	16,680.9	14,723.2	1,117.2	840.5	34,229.8

[1]From U.S. Bureau of the Census, 1980.

[2]Includes 337.5 thousand acres of water according to FIA standards of area classification, but defined by the Bureau of the Census as land.

[3]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[4]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[5]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[6]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 2. -- Area of timberland by Forest Survey Unit, county, and ownership class, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	All ownerships	National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Aspen-Birch Unit										
Carlton	340.5	-	-	-	58.9	58.0	10.4	27.0	173.8	12.4
Cook	565.4	362.8	-	2.3	75.0	9.2	32.7	26.2	39.2	18.0
Koochiching	1,423.9	-	12.1	17.5	734.4	278.8	35.3	203.1	125.6	17.1
Lake	850.1	384.6	-	3.3	106.7	143.6	-	78.3	89.9	43.7
St. Louis	2,698.8	506.5	1.4	8.9	356.3	744.8	24.0	127.7	678.5	250.7
Total	5,878.7	1,253.9	13.5	32.0	1,331.3	1,234.4	102.4	462.3	1,107.0	341.9
Northern Pine Unit										
Aitkin	700.5	-	-	7.9	249.9	196.3	-	11.3	228.8	6.3
Becker	332.3	-	-	26.2	20.2	87.6	2.3	4.7	185.3	6.0
Beltrami	835.6	57.8	-	-	243.6	138.6	201.6	2.0	183.6	8.4
Cass	841.6	241.1	-	3.0	104.7	232.9	18.4	32.4	193.8	15.3
Clearwater	285.2	-	-	2.6	25.3	66.8	54.8	2.9	130.1	2.7
Crow Wing	385.7	-	-	-	20.4	89.6	-	16.5	231.5	27.7
Hubbard	399.8	-	-	0.9	52.1	121.2	-	21.5	196.1	8.0
Itasca	1,323.4	268.3	-	-	253.8	255.7	2.3	169.0	303.0	71.3
Lake of the Woods	391.5	-	12.6	7.9	226.0	3.1	72.9	2.2	63.7	3.1
Mahnomen	112.1	-	-	11.3	23.6	5.7	16.6	-	54.9	-
Roseau	217.2	-	-	10.7	123.9	3.4	4.9	-	71.1	3.2
Wadena	119.1	-	-	-	13.4	0.8	-	22.5	79.1	3.3
Total	5,944.0	567.2	12.6	70.5	1,356.9	1,201.7	373.8	285.0	1,921.0	155.3
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	70.4	-	-	-	6.6	1.0	-	-	54.2	8.6
Benton-Sherburne	85.4	-	-	18.2	8.6	-	-	-	57.3	1.3
Carver-Hennepin-Scott	44.9	-	-	2.1	6.2	3.9	-	-	30.6	2.1
Chisago-Isanti	101.6	-	-	-	7.5	3.7	-	-	86.7	3.7
Douglas-Todd	128.1	-	-	6.9	6.1	1.6	-	-	110.4	3.1
Fillmore-Olmsted	139.3	-	-	-	13.0	1.8	-	1.4	120.1	3.0
Goodhue	68.8	-	-	3.1	6.2	-	-	-	55.5	3.2
Houston	133.9	-	-	6.6	8.8	-	1.2	-	115.1	2.2
Kanabec	139.8	-	-	-	14.9	7.8	-	-	115.8	1.3
Le Sueur-Rice	42.1	-	-	-	3.2	0.9	-	-	38.0	-
Mille Lacs	138.4	-	-	4.8	33.8	-	5.0	-	94.3	0.5
Morrison	166.4	-	-	0.7	30.4	-	-	-	116.3	19.0
Otter Tail	208.2	-	-	-	3.3	1.2	-	-	196.2	7.5
Pine	486.4	-	-	3.1	111.5	32.3	1.4	2.6	310.7	24.8
Stearns	69.2	-	-	-	-	0.9	-	-	65.1	3.2
Wabasha	67.9	-	-	6.5	10.1	-	-	-	47.8	3.5
Winona	126.6	-	-	3.3	25.2	2.0	-	-	90.5	5.6
Wright	43.3	-	-	-	2.8	1.7	-	-	36.5	2.3
Total	2,260.7	-	-	55.3	298.2	59.6	7.6	4.0	1,741.1	94.9

(Table 2 continued on next page)

(Table 2 continued)

Forest Survey Unit and county	All ownerships	National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Prairie Unit										
Blue Earth-Fairbault	46.5	-	-	-	-	-	-	-	45.3	1.2
Clay-Norman	48.4	-	-	-	1.1	2.4	-	-	42.1	2.8
Eastern Group[1]	45.4	-	-	-	2.8	-	-	-	40.5	2.1
Kandiyohi-Meeker	42.0	-	-	3.1	4.3	-	-	-	33.7	0.9
Kittson	65.1	-	-	-	18.4	2.3	-	-	42.0	2.4
Marshall	133.3	-	-	8.6	37.4	-	-	-	86.4	0.9
Northern Group[2]	49.0	-	-	-	3.3	-	-	-	43.4	2.3
Pennington-Red Lake	62.1	-	-	0.9	2.2	-	-	-	57.9	1.1
Polk	58.5	-	-	-	5.6	2.3	-	-	47.3	3.3
Southern Group[3]	36.4	-	-	-	-	-	-	-	36.4	-
Western Group[4]	53.1	-	-	1.2	1.0	-	-	-	47.0	3.9
Total	639.8	-	-	13.8	76.1	7.0	-	-	522.0	20.9
All counties	14,723.2	1,821.1	26.1	171.6	3,062.5	2,502.7	483.8	751.3	5,291.1	613.0

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[2]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[4]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 3. -- Area of timberland by Forest Survey Unit, county, and forest type group/local type, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	All types	Forest type group/local type																	
		White-red-jack pine				Spruce-fir						Oak-hickory	Elm-ash-cottonwood	Maple-beech-birch	Aspen-birch				Non-stocked
		Total	Jack pine	Red pine	White pine	Total	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Total	Aspen	Paper birch	Balsam poplar	Non-stocked
Aspen-Birch Unit																			
Carlton	340.5	8.9	-	8.3	0.6	68.6	14.3	2.3	22.1	4.8	25.1	3.2	43.0	29.5	179.5	142.7	21.7	15.1	7.8
Cook	565.4	23.3	9.1	10.6	3.6	230.7	92.9	18.1	62.6	53.6	3.5	-	14.1	41.5	253.2	181.5	67.5	4.2	2.6
Koochiching	1,423.9	38.1	17.4	19.0	1.7	757.1	90.5	9.2	332.6	226.0	98.8	1.3	129.3	19.9	465.7	373.3	24.8	67.6	12.5
Lake	850.1	70.1	28.3	33.1	8.7	329.8	123.1	18.5	133.1	51.3	3.8	1.5	33.4	59.6	352.0	187.4	152.0	12.6	3.7
St. Louis	2,698.8	171.7	88.3	64.7	18.7	871.8	223.5	22.0	392.8	109.4	124.1	3.3	168.0	110.9	1,335.3	1,092.2	186.0	57.1	37.8
Total	5,878.7	312.1	143.1	135.7	33.3	2,258.0	544.3	70.1	943.2	445.1	255.3	9.3	387.8	261.4	2,585.7	1,977.1	452.0	156.6	64.4
Northern Pine Unit																			
Aitkin	700.5	9.6	1.3	8.3	-	173.1	13.8	2.7	56.7	18.8	81.1	24.4	92.9	127.8	267.8	221.3	37.5	9.0	4.9
Becker	332.3	18.6	10.8	6.6	1.2	32.2	9.4	-	3.0	-	19.8	46.7	20.6	49.8	162.2	144.8	16.7	0.7	2.2
Beltrami	835.6	61.4	30.2	30.0	1.2	212.5	17.3	3.7	48.1	59.7	83.7	16.2	71.7	56.9	408.9	308.1	34.7	66.1	8.0
Cass	841.6	108.6	48.0	54.6	6.0	115.5	17.5	5.0	16.5	40.9	35.6	50.2	49.3	68.0	444.8	358.8	71.2	14.8	5.2
Clearwater	285.2	13.4	5.6	6.9	0.9	36.3	11.4	-	6.5	7.8	10.6	7.3	19.4	31.1	177.7	143.8	14.3	19.6	-
Crow Wing	385.7	46.4	32.8	11.3	2.3	26.8	0.8	0.9	9.2	0.9	15.0	77.9	38.1	23.6	171.1	147.4	23.7	-	1.8
Hubbard	399.8	85.0	59.4	23.3	2.3	34.3	14.1	3.1	5.2	0.9	11.0	14.1	21.9	15.1	227.1	199.1	24.7	3.3	2.3
Itasca	1,323.4	88.7	32.4	49.4	6.9	351.0	75.8	18.4	119.9	68.5	68.4	12.1	128.3	84.6	651.8	522.0	82.1	47.7	6.9
Lake of the Woods	391.5	27.8	23.1	4.7	-	174.3	14.3	3.3	69.3	33.6	53.8	1.8	11.5	-	163.7	123.9	10.1	29.7	12.4
Mahnomen	112.1	-	-	-	-	3.0	0.9	1.1	-	-	1.0	17.6	7.7	33.9	49.9	45.0	3.1	1.8	-
Roseau	217.2	25.9	22.3	3.6	-	45.5	4.0	1.8	13.8	5.4	20.5	1.0	19.7	-	122.9	90.4	-	32.5	2.2
Wadena	119.1	48.3	29.5	15.3	3.5	4.2	0.9	-	-	-	3.3	22.1	6.9	1.4	36.2	33.6	1.3	1.3	-
Total	5,944.0	533.7	295.4	214.0	24.3	1,208.7	180.2	40.0	348.2	236.5	403.8	291.4	488.0	492.2	2,884.1	2,338.2	319.4	226.5	45.9
Central Hardwood Unit																			
Anoka-Dakota-Ramsey-Washington	70.4	0.6	0.6	-	-	-	-	-	-	-	-	30.8	7.9	22.4	8.7	5.8	2.9	-	-
Benton-Sherburne	85.4	11.4	3.6	7.8	-	-	-	-	-	-	-	51.7	10.3	6.6	5.4	5.4	-	-	-
Carver-Hennepin-Scott	44.9	-	-	-	-	-	-	-	-	-	-	21.3	12.5	10.5	0.6	0.6	-	-	-
Chisago-Isanti	101.6	3.6	0.4	3.2	-	5.4	-	0.2	2.4	-	2.8	39.7	20.0	19.5	13.4	11.2	2.2	-	-
Douglas-Todd	128.1	1.1	1.1	-	-	3.8	-	-	-	-	3.8	47.1	28.3	21.3	26.5	23.3	2.0	1.2	-
Fillmore-Olmsted	139.3	-	-	-	-	-	-	-	-	-	-	83.8	17.8	35.0	2.7	2.7	-	-	-
Goodhue	68.8	-	-	-	-	-	-	-	-	-	-	24.5	14.5	16.3	13.5	8.9	4.6	-	-
Houston	133.9	0.5	-	0.5	-	-	-	-	-	-	-	92.7	11.4	16.8	12.5	6.2	6.3	-	-
Kanabec	139.8	-	-	-	-	4.6	-	0.8	2.2	-	1.6	27.5	16.3	31.4	58.6	53.4	4.1	1.1	1.4
Le Sueur-Rice	42.1	-	-	-	-	-	-	-	-	-	-	4.4	11.7	25.2	0.8	0.8	-	-	-
Mille Lacs	138.4	-	-	-	-	4.8	-	-	-	-	4.8	21.5	25.6	35.3	51.2	44.8	6.4	-	-
Morrison	166.4	8.2	2.0	3.8	2.4	4.0	-	-	-	-	4.0	50.8	9.4	22.4	71.6	67.6	4.0	-	-
Otter Tail	208.2	3.0	2.8	-	0.2	8.2	-	-	-	-	8.2	51.0	23.8	62.7	58.3	48.8	4.1	5.4	1.2
Pine	486.4	19.7	8.3	8.9	2.5	46.5	8.3	-	24.1	-	14.1	28.3	52.3	74.0	264.4	242.6	18.2	3.6	1.2
Stearns	69.2	-	-	-	-	1.5	-	-	-	-	1.5	21.5	19.2	23.0	2.4	-	-	2.4	1.6
Wabasha	67.9	0.3	-	0.3	-	-	-	-	-	-	-	48.3	3.9	11.7	3.7	3.7	-	-	-
Winona	126.6	-	-	-	-	-	-	-	-	-	-	91.3	15.4	17.9	2.0	1.0	1.0	-	-
Wright	43.3	-	-	-	-	-	-	-	-	-	-	5.9	10.8	25.6	1.0	1.0	-	-	-
Total	2,260.7	48.4	18.8	24.5	5.1	78.8	8.3	1.0	28.7	-	40.8	742.1	311.1	477.6	597.3	527.8	55.8	13.7	5.4

(Table 3 continued on next page)

(Table 3 continued)

Forest Survey Unit and county	All types	Forest type group/local type																	
		White-red-jack pine				Spruce-fir						Oak-hickory	Elm-ash-cottonwood	Maple-beech-birch	Aspen-birch				Non-stocked
		Total	Jack pine	Red pine	White pine	Total	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Total	Aspen	Paper birch	Balsam poplar	
Prairie Unit																			
Blue Earth-Fairbault	46.5	-	-	-	-	-	-	-	-	-	-	10.8	12.2	23.5	-	-	-	-	-
Clay-Norman	48.4	-	-	-	-	-	-	-	-	-	-	16.5	10.1	5.4	16.4	16.4	-	-	-
Eastern Group[1]	45.4	-	-	-	-	-	-	-	-	-	-	25.9	8.2	10.4	0.9	0.9	-	-	-
Kandiyohi-Meeker	42.0	-	-	-	-	-	-	-	-	-	-	13.8	10.0	18.2	-	-	-	-	-
Kittson	65.1	-	-	-	-	-	-	-	-	-	-	2.2	3.6	8.0	51.3	50.2	-	1.1	-
Marshall	133.3	-	-	-	-	7.2	-	-	2.0	-	5.2	6.6	7.7	4.3	106.4	87.3	-	19.1	1.1
Northern Group[2]	49.0	-	-	-	-	-	-	-	-	-	-	7.7	13.7	26.4	1.2	1.2	-	-	-
Pennington-Red Lake	62.1	-	-	-	-	-	-	-	-	-	-	13.4	-	6.8	41.9	35.3	-	6.6	-
Polk	58.5	1.1	-	1.1	-	-	-	-	-	-	-	12.1	9.0	14.6	21.7	20.6	-	1.1	-
Southern Group[3]	36.4	-	-	-	-	-	-	-	-	-	-	7.4	8.4	20.6	-	-	-	-	-
Western Group[4]	53.1	1.0	-	-	1.0	-	-	-	-	-	-	6.4	20.1	23.7	-	-	-	-	1.9
Total	639.8	2.1	-	1.1	1.0	7.2	-	-	2.0	-	5.2	122.8	103.0	161.9	239.8	211.9	-	27.9	3.0
All counties	14,723.2	896.3	457.3	375.3	63.7	3,552.7	732.8	111.1	1,322.1	681.6	705.1	1,165.6	1,289.9	1,393.1	6,306.9	5,055.0	827.2	424.7	118.7

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[2]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[4]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 4. -- Area of timberland by Forest Survey Unit, county, and stand-size class, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling-seedling	Nonstocked
Aspen-Birch Unit					
Carlton	340.5	72.8	139.8	120.1	7.8
Cook	565.4	207.1	215.0	140.7	2.6
Koochiching	1,423.9	273.5	524.9	613.0	12.5
Lake	850.1	240.7	317.1	288.6	3.7
St. Louis	2,698.8	708.2	972.7	980.1	37.8
Total	5,878.7	1,502.3	2,169.5	2,142.5	64.4
Northern Pine Unit					
Aitkin	700.5	235.2	274.6	185.8	4.9
Becker	332.3	141.8	137.0	51.3	2.2
Beltrami	835.6	253.4	321.5	252.7	8.0
Cass	841.6	319.2	317.0	200.2	5.2
Clearwater	285.2	96.5	113.2	75.5	-
Crow Wing	385.7	159.2	146.2	78.5	1.8
Hubbard	399.8	104.0	199.6	93.9	2.3
Itasca	1,323.4	427.4	432.6	456.5	6.9
Lake of the Woods	391.5	90.6	142.7	145.8	12.4
Mahnomen	112.1	30.5	54.3	27.3	-
Roseau	217.2	49.9	76.9	88.2	2.2
Wadena	119.1	34.4	43.6	41.1	-
Total	5,944.0	1,942.1	2,259.2	1,696.8	45.9
Central Hardwood Unit					
Anoka-Dakota-Ramsey-Washington	70.4	47.6	19.6	3.2	-
Benton-Sherburne	85.4	44.8	25.2	15.4	-
Carver-Hennepin-Scott	44.9	28.5	6.0	10.4	-
Chisago-Isanti	101.6	46.4	28.9	26.3	-
Douglas-Todd	128.1	68.2	36.3	23.6	-
Fillmore-Olmsted	139.3	104.4	20.8	14.1	-
Goodhue	68.8	54.6	10.0	4.2	-
Houston	133.9	98.1	14.3	21.5	-
Kanabec	139.8	49.3	49.0	40.1	1.4
Le Sueur-Rice	42.1	28.9	3.5	9.7	-
Mille Lacs	138.4	51.1	59.7	27.6	-
Morrison	166.4	63.0	85.2	18.2	-
Otter Tail	208.2	96.3	67.0	43.7	1.2
Pine	486.4	131.4	210.3	143.5	1.2
Stearns	69.2	39.9	18.1	9.6	1.6
Wabasha	67.9	51.0	12.4	4.5	-
Winona	126.6	96.7	22.0	7.9	-
Wright	43.3	33.1	3.5	6.7	-
Total	2,260.7	1,133.3	691.8	430.2	5.4

(Table 4 continued on next page)

(Table 4 continued)

Forest Survey Unit and county	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling-seedling	Nonstocked
Prairie Unit					
Blue Earth-Fairbault	46.5	37.7	2.4	6.4	-
Clay-Norman	48.4	30.9	8.8	8.7	-
Eastern Group[1]	45.4	36.1	4.4	4.9	-
Kandiyohi-Meeker	42.0	35.4	1.9	4.7	-
Kittson	65.1	6.0	31.8	27.3	-
Marshall	133.3	15.3	46.1	70.8	1.1
Northern Group[2]	49.0	38.4	2.3	8.3	-
Pennington-Red Lake	62.1	18.9	19.9	23.3	-
Polk	58.5	31.2	19.8	7.5	-
Southern Group[3]	36.4	25.2	4.8	6.4	-
Western Group[4]	53.1	37.5	7.3	6.4	1.9
Total	639.8	312.6	149.5	174.7	3.0
All counties	14,723.2	4,890.3	5,270.0	4,444.2	118.7

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.
[2]Includes: McLeod, Nicollet, Renville, and Sibley counties.
[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.
[4]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 5. -- Area of timberland by Forest Survey Unit, county, and potential productivity class, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Aspen-Birch Unit						
Carlton	340.5	-	5.3	68.0	132.9	134.3
Cook	565.4	-	3.8	82.8	186.1	292.7
Koochiching	1,423.9	-	16.1	222.7	324.7	860.4
Lake	850.1	-	11.5	99.7	254.3	484.6
St. Louis	2,698.8	0.9	55.8	496.4	935.6	1,210.1
Total	5,878.7	0.9	92.5	969.6	1,833.6	2,982.1
Northern Pine Unit						
Aitkin	700.5	-	10.1	145.9	228.0	316.5
Becker	332.3	-	1.7	62.2	149.0	119.4
Beltrami	835.6	-	17.3	145.5	280.4	392.4
Cass	841.6	1.5	21.8	204.8	359.4	254.1
Clearwater	285.2	-	6.5	85.2	111.9	81.6
Crow Wing	385.7	-	-	40.4	203.2	142.1
Hubbard	399.8	-	7.7	99.4	176.1	116.6
Itasca	1,323.4	1.6	62.1	457.5	420.3	381.9
Lake of the Woods	391.5	-	-	50.4	119.9	221.2
Mahnomen	112.1	-	-	21.7	45.9	44.5
Roseau	217.2	-	1.8	18.3	83.9	113.2
Wadena	119.1	-	3.9	22.7	53.3	39.2
Total	5,944.0	3.1	132.9	1,354.0	2,231.3	2,222.7
Central Hardwood Unit						
Anoka-Dakota-Ramsey-Washington	70.4	-	-	14.8	47.7	7.9
Benton-Sherburne	85.4	-	3.1	7.1	34.0	41.2
Carver-Hennepin-Scott	44.9	-	-	10.1	19.3	15.5
Chisago-Isanti	101.6	-	2.4	15.2	43.4	40.6
Douglas-Todd	128.1	-	-	24.7	53.1	50.3
Fillmore-Olmsted	139.3	1.4	1.1	24.5	57.8	54.5
Goodhue	68.8	-	0.9	23.5	28.9	15.5
Houston	133.9	1.1	3.1	35.8	54.5	39.4
Kanabec	139.8	1.0	1.2	45.6	65.3	26.7
Le Sueur-Rice	42.1	-	-	20.3	10.3	11.5
Mille Lacs	138.4	-	-	22.2	79.2	37.0
Morrison	166.4	-	1.3	39.1	80.2	45.8
Otter Tail	208.2	-	-	31.8	84.4	92.0
Pine	486.4	-	5.8	144.2	205.3	131.1
Stearns	69.2	-	-	5.2	31.0	33.0
Wabasha	67.9	0.3	2.3	18.7	29.2	17.4
Winona	126.6	-	3.2	25.4	49.3	48.7
Wright	43.3	-	-	9.4	26.7	7.2
Total	2,260.7	3.8	24.4	517.6	999.6	715.3

(Table 5 continued on next page)

(Table 5 continued)

Forest Survey Unit and county	All classes	Potential productivity class (cubic feet of growth per acre per year) 165+	120-164	85-119	50-84	20-49
Prairie Unit						
Blue Earth-Fairbault	46.5	2.0	-	11.9	14.7	17.9
Clay-Norman	48.4	-	-	3.6	26.5	18.3
Eastern Group[1]	45.4	1.9	-	2.8	14.8	25.9
Kandiyohi-Meeker	42.0	-	-	10.9	20.3	10.8
Kittson	65.1	-	-	10.3	30.3	24.5
Marshall	133.3	-	-	18.3	71.8	43.2
Northern Group[2]	49.0	-	3.1	13.4	19.5	13.0
Pennington-Red Lake	62.1	-	-	9.2	33.8	19.1
Polk	58.5	-	-	9.7	23.2	25.6
Southern Group[3]	36.4	-	1.2	9.3	12.8	13.1
Western Group[4]	53.1	-	-	7.4	23.0	22.7
Total	639.8	3.9	4.3	106.8	290.7	234.1
All counties	14,723.2	11.7	254.1	2,948.0	5,355.2	6,154.2

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.
[2]Includes: McLeod, Nicollet, Renville, and Sibley counties.
[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.
[4]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 6. -- Area of timberland by Forest Survey Unit, county, and stocking class of growing-stock trees[1], Minnesota, 1990

(In thousand acres)

Forest Survey Unit and county	All classes	Stocking class of growing-stock trees				
		Nonstocked[2]	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Aspen-Birch Unit						
Carlton	340.5	10.5	81.6	97.8	104.2	46.4
Cook	565.4	4.0	63.8	168.0	228.5	101.1
Koochiching	1,423.9	14.0	210.3	400.6	419.9	379.1
Lake	850.1	7.8	127.1	311.1	283.1	121.0
St. Louis	2,698.8	58.0	462.3	962.0	789.1	427.4
Total	5,878.7	94.3	945.1	1,939.5	1,824.8	1,075.0
Northern Pine Unit						
Aitkin	700.5	8.5	167.7	265.1	176.5	82.7
Becker	332.3	2.2	71.0	158.3	84.9	15.9
Beltrami	835.6	10.9	168.3	305.9	238.1	112.4
Cass	841.6	5.2	119.8	300.7	298.4	117.5
Clearwater	285.2	0.9	67.8	105.3	81.7	29.5
Crow Wing	385.7	2.9	76.4	177.0	93.5	35.9
Hubbard	399.8	2.3	72.4	174.6	108.6	41.9
Itasca	1,323.4	15.2	193.8	492.7	388.5	233.2
Lake of the Woods	391.5	20.1	90.9	124.9	106.0	49.6
Mahnomen	112.1	-	18.8	50.0	28.6	14.7
Roseau	217.2	3.6	62.3	70.7	59.7	20.9
Wadena	119.1	-	34.1	63.7	16.9	4.4
Total	5,944.0	71.8	1,143.3	2,288.9	1,681.4	758.6
Central Hardwood Unit						
Anoka-Dakota-Ramsey-Washington	70.4	-	24.7	39.2	6.5	-
Benton-Sherburne	85.4	3.7	37.0	36.0	5.5	3.2
Carver-Hennepin-Scott	44.9	1.7	15.0	18.7	8.5	1.0
Chisago-Isanti	101.6	-	51.9	35.4	11.9	2.4
Douglas-Todd	128.1	2.5	34.0	71.4	19.7	0.5
Fillmore-Olmsted	139.3	5.5	46.5	64.1	23.2	-
Goodhue	68.8	0.8	19.8	34.0	13.1	1.1
Houston	133.9	-	32.0	73.1	26.4	2.4
Kanabec	139.8	2.5	39.4	71.0	19.4	7.5
Le Sueur-Rice	42.1	-	7.9	30.7	3.5	-
Mille Lacs	138.4	3.2	37.8	58.2	30.3	8.9
Morrison	166.4	-	42.1	91.9	25.7	6.7
Otter Tail	208.2	5.7	82.6	92.1	23.0	4.8
Pine	486.4	2.4	141.7	207.0	105.4	29.9
Stearns	69.2	6.2	27.1	31.1	4.8	-
Wabasha	67.9	-	18.7	44.1	5.1	-
Winona	126.6	1.0	32.2	72.3	20.0	1.1
Wright	43.3	2.0	16.1	21.8	3.4	-
Total	2,260.7	37.2	706.5	1,092.1	355.4	69.5

(Table 6 continued on next page)

(Table 6 continued)

Forest Survey Unit and county	All classes	Stocking class of growing-stock trees				
		Nonstocked[2]	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Prairie Unit						
Blue Earth-Fairbault	46.5	2.0	12.3	27.4	4.8	-
Clay-Norman	48.4	0.9	13.2	21.7	9.0	3.6
Eastern Group[3]	45.4	1.9	21.4	18.3	3.8	-
Kandiyohi-Meeker	42.0	1.5	10.6	29.9	-	-
Kittson	65.1	3.4	16.5	17.0	15.9	12.3
Marshall	133.3	2.2	34.1	44.1	34.4	18.5
Northern Group[4]	49.0	-	8.2	25.9	13.8	1.1
Pennington-Red Lake	62.1	-	17.5	30.4	10.9	3.3
Polk	58.5	2.2	18.8	29.7	6.7	1.1
Southern Group[5]	36.4	-	10.5	21.5	1.5	2.9
Western Group[6]	53.1	3.0	24.2	21.7	2.7	1.5
Total	639.8	17.1	187.3	287.6	103.5	44.3
All counties	14,723.2	220.4	2,982.2	5,608.1	3,965.1	1,947.4

[1]This table is based on the stocking percent of growing-stock trees, rather than that of all live trees. For this table, to use the definition of stocking found in the Appendix, replace the term "all live" with "growing-stock."

[2]Area of nonstocked in this table and Table 8 differs from that in other tables in this report because this table includes land stocked with only growing-stock trees, rather than with all alive trees.

[3]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[4]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[5]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[6]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 7. -- Area of timberland by forest type group/local type and ownership class, Minnesota, 1990

(In thousand acres)

Forest type group/ local type	All ownerships	Ownership class										
			Public						Private			
		Total public	National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Total private	Indian	Forest industry	Individual	Corporate
White-red-jack pine												
Jack pine	457.3	253.7	78.1	2.0	5.0	95.8	72.8	203.6	5.8	51.9	133.4	12.5
Red pine	375.3	253.6	117.8	0.9	4.9	68.2	61.8	121.7	12.6	42.1	60.9	6.1
White pine	63.7	26.6	15.3	-	0.9	5.7	4.7	37.1	1.9	6.0	24.1	5.1
Total	896.3	533.9	211.2	2.9	10.8	169.7	139.3	362.4	20.3	100.0	218.4	23.7
Spruce-fir												
Balsam fir	732.8	495.2	189.0	-	1.3	150.7	154.2	237.6	12.9	69.7	119.4	35.6
White spruce	111.1	76.0	30.5	1.0	-	23.8	20.7	35.1	2.8	13.5	17.0	1.8
Black spruce	1,322.1	1,036.2	248.8	10.3	9.2	561.9	206.0	285.9	41.9	62.7	143.4	37.9
Northern white-cedar	681.6	503.3	93.1	2.4	7.8	288.1	111.9	178.3	60.6	47.2	55.9	14.6
Tamarack	705.1	483.2	32.3	1.0	4.9	321.7	123.3	221.9	43.8	9.1	151.0	18.0
Total	3,552.7	2,593.9	593.7	14.7	23.2	1,346.2	616.1	958.8	162.0	202.2	486.7	107.9
Oak-hickory												
Oak-hickory	1,165.6	206.1	10.0	-	41.8	101.6	52.7	959.5	8.1	2.8	904.8	43.8
Elm-ash-cottonwood												
Elm-ash-soft maple	1,289.9	491.9	59.1	1.6	19.1	198.0	214.1	798.0	40.1	65.5	640.7	51.7
Maple-beech-birch												
Maple-basswood	1,393.1	447.8	109.7	-	24.1	128.1	185.9	945.3	41.5	49.6	793.8	60.4
Aspen-birch												
Aspen	5,055.0	2,555.2	641.7	5.8	36.3	865.5	1,005.9	2,499.8	160.6	273.1	1,822.3	243.8
Paper birch	827.2	472.6	165.8	-	8.2	106.3	192.3	354.6	31.7	33.8	233.9	55.2
Balsam poplar	424.7	205.3	21.1	-	5.2	105.9	73.1	219.4	15.9	20.9	161.0	21.6
Total	6,306.9	3,233.1	828.6	5.8	49.7	1,077.7	1,271.3	3,073.8	208.2	327.8	2,217.2	320.6
Nonstocked	118.7	77.3	8.8	1.1	2.9	41.2	23.3	41.4	3.6	3.4	29.5	4.9
All types	14,723.2	7,584.0	1,821.1	26.1	171.6	3,062.5	2,502.7	7,139.2	483.8	751.3	5,291.1	613.0

Table 8. -- Area of timberland by ownership class and stocking class of growing-stock trees[1], Minnesota, 1990

(In thousand acres)

Ownership class	All classes	Stocking class of growing-stock trees				
		Nonstocked [2]	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Public						
National forest	1,821.1	16.2	137.5	542.3	739.4	385.7
Bureau of Land Mgmt.	26.1	1.1	5.8	5.5	8.7	5.0
Other federal	171.6	2.9	44.6	77.7	31.6	14.8
State	3,062.5	60.8	569.2	1,007.4	872.0	553.1
County and municipal	2,502.7	39.9	485.1	919.5	684.7	373.5
Total	7,584.0	120.9	1,242.2	2,552.4	2,336.4	1,332.1
Private						
Indian	483.8	5.0	105.2	174.7	122.4	76.5
Forest industry	751.3	5.6	111.7	257.7	232.7	143.6
Individual	5,291.1	82.4	1,409.0	2,363.7	1,113.1	322.9
Corporate	613.0	6.5	114.1	259.6	160.5	72.3
Total	7,139.2	99.5	1,740.0	3,055.7	1,628.7	615.3
All owners	14,723.2	220.4	2,982.2	5,608.1	3,965.1	1,947.4

[1]This table is based on the stocking percent of growing-stock trees, rather than that of all live trees. For this table, to use the definition of stocking found in the Appendix, replace the term "all live" with "growing-stock."

[2]Area of nonstocked in this table and in Table 6 differs from that in other tables in this report because this table includes land stocked with only growing-stock trees, rather than with all live trees.

Table 9. -- Area of timberland by forest type group/local type and stand-size class, Minnesota, 1990

(In thousand acres)

Forest type group/ local type	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling-seedling	Nonstocked
White-red-jack pine					
Jack pine	457.3	206.4	152.5	98.4	-
Red pine	375.3	174.1	85.7	115.5	-
White pine	63.7	52.8	8.5	2.4	-
Total	896.3	433.3	246.7	216.3	-
Spruce-fir					
Balsam fir	732.8	181.5	315.9	235.4	-
White spruce	111.1	31.9	34.9	44.3	-
Black spruce	1,322.1	69.0	448.4	804.7	-
Northern white-cedar	681.6	298.7	277.9	105.0	-
Tamarack	705.1	102.9	252.3	349.9	-
Total	3,552.7	684.0	1,329.4	1,539.3	-
Oak-hickory					
Oak-hickory	1,165.6	780.8	299.4	85.4	-
Elm-ash-cottonwood					
Elm-ash-soft maple	1,289.9	404.2	505.5	380.2	-
Maple-beech-birch					
Maple-basswood	1,393.1	763.6	386.0	243.5	-
Aspen-birch					
Aspen	5,055.0	1,513.7	1,840.1	1,701.2	-
Paper birch	827.2	198.9	505.8	122.5	-
Balsam poplar	424.7	111.8	157.1	155.8	-
Total	6,306.9	1,824.4	2,503.0	1,979.5	-
Nonstocked	118.7	-	-	-	118.7
All types	14,723.2	4,890.3	5,270.0	4,444.2	118.7

Table 10. -- Number of all live trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Jack pine	164,327	45,333	33,320	33,600	25,947	15,616	6,718	2,696	779	237	55	26	-
Red pine	97,831	20,352	20,952	21,187	14,741	8,000	4,676	3,144	2,086	1,352	767	573	1
White pine	29,585	9,066	5,273	4,629	2,904	2,206	1,615	1,200	753	579	494	747	119
White spruce	78,622	28,790	18,129	13,231	7,860	4,470	2,906	1,460	870	501	254	151	-
Black spruce	1,039,448	514,723	328,948	143,887	40,720	9,028	1,720	262	114	22	11	12	1
Balsam fir	979,674	532,426	245,269	119,462	52,158	20,833	7,160	1,743	476	95	30	21	1
Tamarack	361,404	159,376	101,543	61,864	25,389	8,964	2,906	939	319	51	38	15	-
Eastern redcedar	14,057	7,230	3,404	1,690	1,270	260	144	31	13	12	-	3	-
Northern white-cedar	386,827	131,365	90,485	73,725	47,048	24,361	11,002	5,235	2,187	793	391	232	3
Other softwoods	2,036	351	659	543	301	107	38	28	8	-	-	1	-
Total softwoods	3,153,811	1,449,012	847,982	473,818	218,338	93,845	38,885	16,738	7,605	3,642	2,040	1,781	125
Hardwoods													
Select white oak	200,922	70,346	42,281	33,445	19,125	13,324	8,818	5,368	3,442	2,173	1,064	1,356	180
Select red oak	111,795	26,736	12,034	14,400	16,900	15,851	10,193	6,331	4,135	2,322	1,307	1,438	148
Other red oak	6,688	1,464	801	1,100	1,300	419	530	342	278	118	133	184	19
Select hickory	9,152	4,833	2,282	624	560	332	260	154	62	27	12	6	-
Other hickory	8,048	4,592	1,298	1,079	651	241	100	55	12	11	6	3	-
Basswood	192,117	78,585	36,178	27,623	18,630	13,604	7,584	4,488	2,424	1,451	703	783	64
Yellow birch	11,748	5,998	2,160	1,065	824	486	344	379	164	125	92	101	10
Hard maple	283,944	150,228	59,083	39,537	16,319	7,878	4,684	2,709	1,728	907	446	409	16
Soft maple	300,337	135,233	82,996	50,646	17,850	7,552	2,750	1,420	746	417	285	343	99
Elm	174,962	91,001	41,007	21,079	9,768	5,226	3,146	1,439	991	517	349	380	59
Black ash	527,551	277,683	124,118	64,093	34,549	15,831	6,848	2,825	989	393	131	86	5
White & green ash	88,731	47,913	16,064	8,943	5,975	4,318	2,515	1,411	751	385	221	207	28
Cottonwood	2,734	663	376	218	275	296	201	116	122	86	94	178	109
Willow	5,651	2,190	264	574	651	642	486	328	187	159	60	89	21
Hackberry	14,715	10,414	2,402	1,061	365	193	93	85	42	32	10	16	2
Balsam poplar	265,832	137,527	47,191	31,213	22,660	14,516	7,180	3,292	1,345	599	197	109	3
Bigtooth aspen	73,000	38,160	7,852	6,112	6,339	6,091	4,543	2,326	980	399	139	58	1
Quaking aspen	1,986,691	1,213,407	293,738	160,361	122,072	92,211	56,894	28,490	12,526	4,486	1,511	982	13
Paper birch	570,922	186,324	140,402	111,967	74,208	36,524	13,923	4,942	1,669	646	180	132	5
Black cherry	35,436	27,358	3,977	1,837	1,328	513	226	121	49	19	7	1	-
Black walnut	2,286	729	437	96	448	160	136	105	93	50	19	13	-
Butternut	2,946	736	616	202	518	295	235	126	106	73	17	19	3
Other hardwoods	68,351	34,857	13,179	8,311	5,107	3,141	1,609	1,005	496	285	179	155	27
Total hardwoods	4,944,559	2,546,977	930,736	585,586	376,422	239,644	133,298	67,857	33,337	15,680	7,162	7,048	812
Noncommercial species	343,481	288,665	41,776	10,867	1,695	359	79	28	-	5	-	5	2
All species	8,441,851	4,284,654	1,820,494	1,070,271	596,455	333,848	172,262	84,623	40,942	19,327	9,202	8,834	939

Table 11. -- Number of growing-stock trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Jack pine	156,774	43,834	30,947	31,879	25,094	15,013	6,434	2,590	708	203	47	25	-
Red pine	96,400	20,083	20,382	21,059	14,572	7,855	4,583	3,121	2,068	1,352	763	561	1
White pine	25,930	7,326	4,983	3,941	2,585	1,928	1,460	1,123	721	568	467	716	112
White spruce	77,495	28,691	17,850	12,753	7,786	4,358	2,861	1,433	863	495	254	151	-
Black spruce	1,022,264	508,581	321,611	141,162	39,995	8,831	1,674	262	102	22	11	12	1
Balsam fir	953,850	521,972	234,835	116,774	50,915	20,299	6,836	1,648	429	93	30	19	-
Tamarack	350,608	158,656	97,539	58,697	23,814	8,109	2,591	840	274	39	37	12	-
Eastern redcedar	12,760	6,980	3,131	1,256	1,013	199	135	23	13	7	-	3	-
Northern white-cedar	334,576	125,689	78,316	60,063	37,249	18,709	8,100	3,823	1,612	591	268	155	1
Other softwoods	1,634	351	575	300	291	71	18	20	8	-	-	-	-
Total softwoods	3,032,291	1,422,163	810,169	447,884	203,314	85,372	34,692	14,883	6,798	3,370	1,877	1,654	115
Hardwoods													
Select white oak	176,496	65,987	37,980	28,962	16,452	10,985	6,685	3,975	2,506	1,466	710	741	47
Select red oak	100,388	26,688	10,891	11,730	15,225	14,073	8,934	5,421	3,431	1,930	1,015	980	70
Other red oak	5,300	1,464	672	762	1,115	335	340	203	179	74	66	85	5
Select hickory	8,789	4,833	2,183	560	469	306	232	132	46	21	3	4	-
Other hickory	7,531	4,559	1,083	978	554	219	83	43	6	4	2	-	-
Basswood	176,542	76,522	31,583	24,183	16,864	12,378	6,729	3,918	2,057	1,212	548	516	32
Yellow birch	9,543	5,731	1,733	839	414	258	158	182	91	54	46	36	1
Hard maple	248,742	138,760	51,247	33,508	13,111	5,439	3,084	1,618	1,027	530	226	185	7
Soft maple	260,330	128,118	69,289	40,566	13,608	5,200	1,674	816	403	226	164	202	64
Elm	159,088	87,646	35,941	17,916	7,748	4,437	2,520	1,126	768	404	261	284	37
Black ash	497,620	268,596	112,616	59,545	32,234	14,510	6,192	2,523	898	329	112	65	-
White & green ash	81,551	47,222	13,868	7,616	5,173	3,490	1,941	1,105	576	271	161	107	21
Cottonwood	2,631	663	376	193	275	296	169	109	119	84	94	166	87
Willow	4,294	2,190	93	225	482	483	327	203	127	95	33	32	4
Hackberry	13,350	9,931	2,036	779	280	126	71	56	26	28	10	6	1
Balsam poplar	254,930	136,649	44,071	28,769	20,500	13,386	6,622	2,972	1,213	515	149	82	2
Bigtooth aspen	69,060	38,115	7,263	5,600	5,706	5,384	3,953	1,883	769	285	73	28	1
Quaking aspen	1,900,116	1,205,275	278,120	143,935	107,954	80,363	47,657	22,995	9,422	2,979	939	473	4
Paper birch	527,199	178,191	127,580	102,206	67,737	33,246	12,179	4,170	1,259	458	97	73	3
Black cherry	31,856	26,469	3,290	947	609	277	144	69	28	19	4	-	-
Black walnut	2,052	702	371	73	448	114	110	92	77	45	9	11	-
Butternut	2,022	736	511	31	276	182	136	60	44	26	14	6	-
Other hardwoods	49,898	32,969	8,152	4,176	2,218	1,414	446	276	146	61	28	11	1
Total hardwoods	4,589,328	2,488,016	840,949	514,099	329,452	206,901	110,386	53,947	25,218	11,116	4,764	4,093	387
All species	7,621,619	3,910,179	1,651,118	961,983	532,766	292,273	145,078	68,830	32,016	14,486	6,641	5,747	502

Table 12. -- Net volume of growing stock on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Jack pine	553,019	75,689	134,713	145,501	100,294	60,316	23,311	8,775	2,525	1,895	-
Red pine	585,215	56,562	82,073	79,422	74,811	74,997	69,675	59,730	43,826	44,016	103
White pine	263,829	8,879	13,838	18,447	23,378	26,976	24,401	26,200	28,264	72,623	20,823
White spruce	296,414	33,588	46,904	48,045	49,850	36,653	30,881	23,020	15,196	12,277	-
Black spruce	746,180	377,748	233,990	93,462	27,981	6,569	3,680	989	599	1,070	92
Balsam fir	963,830	293,095	290,769	208,324	110,869	39,422	14,250	4,117	1,724	1,260	-
Tamarack	475,656	164,341	147,301	87,282	43,316	19,906	8,999	1,678	1,966	867	-
Eastern redcedar	14,959	3,479	5,720	1,989	2,236	607	418	302	-	208	-
Northern white-cedar	744,792	133,887	182,201	161,670	108,007	74,849	42,028	20,698	11,819	9,563	70
Other softwoods	3,743	681	1,431	680	277	439	235	-	-	-	-
Total softwoods	4,647,637	1,147,949	1,138,940	844,822	541,019	340,734	217,878	145,509	105,919	143,779	21,088
Hardwoods											
Select white oak	647,392	63,413	85,122	100,137	95,350	82,575	71,742	54,832	33,920	53,241	7,060
Select red oak	818,970	28,667	81,410	134,415	135,126	119,548	103,803	78,259	52,525	74,871	10,346
Other red oak	36,749	1,869	5,408	3,127	4,788	4,255	4,951	2,692	3,180	5,794	685
Select hickory	16,348	1,362	2,503	2,964	3,673	2,997	1,595	867	147	240	-
Other hickory	9,822	2,248	2,853	1,996	1,304	937	205	181	98	-	-
Basswood	692,132	65,307	101,976	133,469	109,971	93,014	66,561	50,473	28,686	38,412	4,263
Yellow birch	21,876	2,027	2,305	2,599	2,495	3,851	2,460	2,010	2,013	2,041	75
Hard maple	403,671	89,456	79,329	58,128	52,147	39,403	33,883	23,359	12,885	14,010	1,071
Soft maple	345,140	102,602	79,344	54,167	28,322	20,113	13,278	10,125	8,891	17,098	11,200
Elm	269,571	39,581	42,450	43,286	38,969	25,471	23,553	16,130	13,172	21,409	5,550
Black ash	700,461	153,097	186,945	149,158	99,879	59,078	28,626	13,542	5,749	4,387	-
White & green ash	186,757	18,274	29,120	34,546	29,952	25,480	18,040	11,096	8,724	8,577	2,948
Cottonwood	52,385	452	1,291	2,775	2,740	2,437	3,768	3,460	4,738	13,538	17,186
Willow	29,374	493	2,495	4,476	4,821	4,461	3,795	3,708	1,683	2,686	756
Hackberry	9,885	1,898	1,456	1,180	1,030	1,341	770	1,099	498	456	157
Balsam poplar	595,247	76,527	120,224	140,848	108,358	71,385	40,383	22,163	8,193	6,871	295
Bigtooth aspen	279,740	16,538	37,128	61,382	69,847	47,990	27,229	13,151	4,305	2,048	122
Quaking aspen	3,818,495	383,975	653,941	871,447	804,576	564,479	316,852	133,039	52,978	36,557	651
Paper birch	1,458,718	294,044	424,051	361,138	206,853	100,929	41,240	19,446	5,225	5,302	490
Black cherry	15,688	2,771	3,786	3,055	2,461	1,729	925	777	184	-	-
Black walnut	14,163	172	2,868	1,354	2,005	2,255	2,469	1,789	503	748	-
Butternut	11,150	119	1,828	2,094	2,270	1,404	1,315	949	738	433	-
Other hardwoods	51,687	8,786	11,416	12,156	5,954	5,457	3,885	2,190	1,157	584	102
Total hardwoods	10,485,421	1,353,678	1,959,249	2,179,897	1,812,891	1,280,589	811,328	465,337	250,192	309,303	62,957
All species	15,133,058	2,501,627	3,098,189	3,024,719	2,353,910	1,621,323	1,029,206	610,846	356,111	453,082	84,045

Table 13. -- Net volume of growing stock in the saw-log portion of sawtimber trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	292,482	118,524	87,466	53,680	20,909	7,906	2,280	1,717	-
Red pine	410,437	69,903	69,047	69,846	64,827	55,458	40,592	40,669	95
White pine	208,232	14,285	19,644	23,218	21,204	22,875	24,738	63,801	18,467
White spruce	195,305	41,272	45,197	33,705	28,489	21,259	14,032	11,351	-
Black spruce	123,781	84,922	26,521	6,253	3,489	938	566	1,005	87
Balsam fir	319,040	168,719	96,252	34,976	12,724	3,689	1,547	1,133	-
Tamarack	143,988	74,271	39,060	18,232	8,269	1,544	1,811	801	-
Eastern redcedar	4,982	1,617	1,970	547	380	276	-	192	-
Northern white-cedar	366,758	131,131	93,693	66,390	37,611	18,591	10,641	8,637	64
Other softwoods	1,398	550	244	392	212	-	-	-	-
Total softwoods	2,066,403	705,194	479,094	307,239	198,114	132,536	96,207	129,306	18,713
Hardwoods									
Select white oak	287,774	-	61,228	58,890	53,279	41,577	25,991	41,261	5,548
Select red oak	416,955	-	87,048	85,623	77,549	59,630	40,482	58,414	8,209
Other red oak	19,464	-	3,059	3,064	3,720	2,060	2,458	4,558	545
Select hickory	6,225	-	2,176	1,997	1,128	634	108	182	-
Other hickory	1,723	-	756	622	143	129	73	-	-
Basswood	289,173	-	73,870	68,791	50,994	39,250	22,512	30,338	3,418
Yellow birch	11,532	-	1,726	2,895	1,932	1,615	1,625	1,677	62
Hard maple	127,480	-	33,817	28,394	25,483	17,916	9,988	11,017	865
Soft maple	78,600	-	17,925	14,263	9,814	7,640	6,794	13,279	8,885
Elm	100,244	-	23,638	17,468	16,934	11,855	9,820	16,227	4,302
Black ash	154,048	-	68,437	44,509	22,300	10,730	4,562	3,510	-
White & green ash	76,960	-	20,097	18,749	13,736	8,556	6,782	6,706	2,334
Cottonwood	35,756	-	1,603	1,585	2,650	2,506	3,503	10,291	13,618
Willow	14,934	-	2,772	2,941	2,656	2,674	1,241	2,054	596
Hackberry	3,779	-	617	935	560	822	376	347	122
Balsam poplar	184,601	-	72,604	52,431	30,610	17,051	6,328	5,347	230
Bigtooth aspen	120,583	-	48,123	36,002	21,053	10,298	3,386	1,623	98
Quaking aspen	1,383,916	-	547,600	419,415	242,838	103,341	41,444	28,763	515
Paper birch	258,512	-	133,323	71,706	30,489	14,603	3,965	4,046	380
Black cherry	4,259	-	1,564	1,252	698	601	144	-	-
Black walnut	7,452	-	1,401	1,701	1,933	1,418	399	600	-
Butternut	5,289	-	1,525	1,046	1,030	753	586	349	-
Other hardwoods	14,152	-	3,983	4,036	2,972	1,703	914	463	81
Total hardwoods	3,603,411	-	1,208,892	938,315	614,501	357,362	193,481	241,052	49,808
All species	5,669,814	705,194	1,687,986	1,245,554	812,615	489,898	289,688	370,358	68,521

Table 14. -- Net volume of sawtimber on timberland by species group and diameter class, Minnesota, 1990

(In thousand board feet)[1]

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	1,706,422	700,534	498,063	310,311	124,150	48,149	14,213	11,002	-
Red pine	2,444,196	405,092	390,400	404,170	386,557	339,850	254,728	262,760	639
White pine	1,297,353	85,668	112,024	134,422	126,281	140,122	155,026	417,611	126,199
White spruce	1,152,492	241,082	256,462	194,920	169,617	129,802	87,629	72,980	-
Black spruce	709,531	486,858	149,462	36,103	20,777	5,716	3,521	6,519	575
Balsam fir	1,859,325	995,007	547,062	202,290	75,588	22,558	9,642	7,178	-
Tamarack	835,291	433,159	221,822	105,424	49,096	9,401	11,262	5,127	-
Eastern redcedar	29,531	9,890	11,319	3,173	2,247	1,673	-	1,229	-
Northern white-cedar	2,193,168	807,416	543,805	385,882	222,725	112,388	65,654	54,877	421
Other softwoods	8,140	3,241	1,386	2,256	1,257	-	-	-	-
Total softwoods	12,235,449	4,167,947	2,731,805	1,778,951	1,178,295	809,659	601,675	839,283	127,834
Hardwoods									
Select white oak	1,823,231	-	394,016	366,059	331,155	260,904	165,200	268,452	37,445
Select red oak	2,638,204	-	557,097	530,963	481,821	374,606	257,740	380,599	55,378
Other red oak	123,676	-	19,791	19,038	23,126	12,894	15,618	29,553	3,656
Select hickory	39,396	-	14,110	12,445	7,007	3,973	687	1,174	-
Other hickory	10,979	-	4,921	3,893	889	812	464	-	-
Basswood	1,822,679	-	469,477	425,607	316,878	246,773	143,271	197,675	22,998
Yellow birch	72,782	-	11,060	18,035	12,008	10,115	10,318	10,834	412
Hard maple	804,576	-	216,336	175,979	158,295	112,696	63,687	71,716	5,867
Soft maple	503,438	-	115,015	88,508	60,995	48,034	43,255	86,885	60,746
Elm	638,862	-	153,133	108,673	105,299	74,404	62,424	105,650	29,279
Black ash	968,817	-	435,586	275,472	138,541	67,382	29,079	22,757	-
White & green ash	485,137	-	127,394	115,861	85,349	53,780	43,227	43,767	15,759
Cottonwood	235,374	-	10,308	9,868	16,501	15,739	22,277	67,273	93,408
Willow	95,126	-	18,090	18,330	16,519	16,796	7,881	13,450	4,060
Hackberry	23,940	-	4,051	5,802	3,476	5,159	2,392	2,238	822
Balsam poplar	1,157,379	-	459,496	323,874	190,173	107,125	40,352	34,797	1,562
Bigtooth aspen	752,257	-	301,943	221,893	130,761	64,831	21,628	10,537	664
Quaking aspen	8,652,491	-	3,451,525	2,587,974	1,507,686	650,253	264,486	187,091	3,476
Paper birch	1,626,662	-	847,796	443,866	189,306	91,673	25,221	26,249	2,551
Black cherry	26,808	-	10,044	7,751	4,331	3,769	913	-	-
Black walnut	46,779	-	8,847	10,530	12,028	8,897	2,551	3,926	-
Butternut	33,340	-	9,733	6,475	6,397	4,722	3,730	2,283	-
Other hardwoods	89,096	-	25,538	25,070	18,466	10,706	5,794	2,981	541
Total hardwoods	22,671,029	-	7,665,307	5,801,966	3,817,007	2,246,043	1,232,195	1,569,887	338,624
All species	34,906,478	4,167,947	10,397,112	7,580,917	4,995,302	3,055,702	1,833,870	2,409,170	466,458

[1] International 1/4-inch rule.

Table 15. -- Net volume of sawtimber on timberland by species group, grade[1], diameter class, and Forest Survey Unit, Minnesota, 1990

(In thousand board feet)[2]

Aspen-Birch Unit

Species group	Log grade 1					Log grade 2					Log grade 3					Log grade 4				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods																				
Jack pine	7,874	7,874	-	-	-	39,900	30,156	9,744	-	-	529,063	458,243	58,981	8,041	3,798	-	-	-	-	-
Red pine	72,349	19,956	25,224	9,090	18,079	113,272	42,453	42,188	19,631	9,000	600,071	393,915	144,963	27,206	33,987	-	-	-	-	-
White pine	140,297	7,390	18,842	12,857	101,208	182,049	51,830	29,407	33,715	67,097	309,724	92,319	86,222	37,057	94,126	16,549	1,572	6,479	8,498	-
White spruce	13,174	-	9,274	3,900	-	48,743	14,271	22,137	3,473	8,862	746,216	480,448	178,271	46,330	41,167	-	-	-	-	-
Black spruce	-	-	-	-	-	7,785	2,506	5,279	-	-	532,517	512,685	17,225	-	2,607	-	-	-	-	-
Balsam fir	-	-	-	-	-	7,338	3,258	4,080	-	-	1,121,676	1,072,406	49,270	-	-	-	-	-	-	-
Tamarack	-	-	-	-	-	19,367	16,652	2,715	-	-	316,221	294,637	21,584	-	-	-	-	-	-	-
Northern white-cedar	13,366	-	3,143	3,905	6,318	132,316	60,585	54,471	8,870	8,390	1,352,442	1,111,787	176,279	33,839	30,537	-	-	-	-	-
Other softwoods	-	-	-	-	-	-	-	-	-	-	430	430	-	-	-	-	-	-	-	-
Total softwoods	247,060	35,220	56,483	29,752	125,605	550,770	221,711	170,021	65,689	93,349	5,508,360	4,416,870	732,795	152,473	206,222	16,549	1,572	6,479	8,498	-
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+
Hardwoods																				
Select white oak	-	-	-	-	-	-	-	-	-	-	19,232	19,232	-	-	-	9,213	2,017	-	-	7,196
Select red oak	3,174	-	3,174	-	-	11,133	5,468	5,665	-	-	22,589	15,434	7,155	-	-	1,484	620	864	-	-
Other red oak	-	-	-	-	-	-	-	-	-	-	528	528	-	-	-	-	-	-	-	-
Basswood	24,249	5,692	7,356	6,257	4,944	25,346	12,141	10,229	-	2,976	79,845	53,105	19,376	3,213	4,151	4,386	2,861	1,525	-	-
Yellow birch	14,886	-	3,179	2,471	9,236	9,159	2,971	3,238	1,708	1,242	20,524	13,021	6,691	237	575	5,565	1,156	1,972	2,437	-
Hard maple	13,214	-	7,220	2,173	3,821	26,247	11,294	10,044	-	4,909	103,208	68,302	20,484	8,791	5,631	12,261	10,375	1,886	-	-
Soft maple	1,788	-	1,788	-	-	4,750	4,750	-	-	-	48,960	33,421	10,220	5,319	-	16,630	10,487	6,143	-	-
Elm	12,421	-	7,653	4,768	-	18,287	9,668	5,526	-	3,093	23,327	8,173	-	3,690	11,464	6,295	-	-	-	6,295
Black ash	12,923	5,747	2,488	4,688	-	60,574	43,375	11,418	1,173	4,608	229,382	192,408	36,974	-	-	20,267	15,311	4,956	-	-
White & green ash	1,588	-	1,588	-	-	4,654	3,688	966	-	-	11,185	9,921	1,264	-	-	1,843	1,843	-	-	-
Cottonwood	-	-	-	-	-	-	-	-	-	-	1,829	1,829	-	-	-	-	-	-	-	-
Willow	-	-	-	-	-	-	-	-	-	-	698	698	-	-	-	-	-	-	-	-
Balsam poplar	31,654	2,333	19,355	2,898	7,068	67,143	34,622	29,036	3,485	-	360,420	271,177	69,170	12,077	7,996	43,030	40,643	2,387	-	-
Bigtooth aspen	2,016	1,050	966	-	-	29,880	9,912	18,607	1,361	-	54,835	47,923	6,912	-	-	2,315	2,315	-	-	-
Quaking aspen	152,409	16,079	104,384	19,187	12,759	474,654	259,954	170,902	26,397	17,401	2,470,424	1,852,633	507,864	60,174	49,753	222,401	175,312	38,134	3,930	5,025
Paper birch	28,153	4,690	19,892	1,190	2,381	129,097	87,132	39,040	2,925	-	559,766	461,629	80,250	7,085	10,802	55,179	39,567	10,158	3,918	1,536
Other hardwoods	-	-	-	-	-	-	-	-	-	-	139	139	-	-	-	-	-	-	-	-
Total hardwoods	298,475	35,591	179,043	43,632	40,209	860,924	484,975	304,671	37,049	34,229	4,006,891	3,049,573	766,360	100,586	90,372	400,869	302,507	68,025	10,285	20,052
All species	545,535	70,811	235,526	73,384	165,814	1,411,694	706,686	474,692	102,738	127,578	9,515,251	7,466,443	1,499,155	253,059	296,594	417,418	304,079	74,504	18,783	20,052

(Table 15 continued on next page)

(Table 15 continued)

Northern Pine Unit

Species group	Log grade 1					Log grade 2					Log grade 3					Log grade 4				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods																				
Jack pine	1,552	-	-	1,552	-	69,246	52,057	17,189	-	-	1,017,181	919,730	85,449	4,835	7,167	-	-	-	-	-
Red pine	173,815	7,398	52,480	49,444	64,493	338,333	66,212	166,783	49,580	55,758	1,038,803	576,942	283,923	94,865	83,073	1,028	1,028	-	-	-
White pine	85,633	13,219	9,930	5,491	56,993	146,962	19,681	49,274	18,811	59,196	205,538	96,577	38,483	18,180	52,298	98,053	16,764	1,810	5,821	73,658
White spruce	5,357	-	-	2,664	2,693	36,197	9,737	19,360	-	7,100	279,906	179,420	63,280	26,093	11,113	2,278	2,278	-	-	-
Black spruce	-	-	-	-	-	6,278	3,953	2,325	-	-	160,107	158,396	1,711	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	15,373	11,076	4,297	-	-	687,589	649,280	38,309	-	-	-	-	-	-	-
Tamarack	-	-	-	-	-	18,785	16,007	-	2,778	-	395,356	359,270	31,303	2,210	2,573	-	-	-	-	-
Northern white-cedar	1,672	-	-	-	1,672	27,804	10,542	5,759	5,412	6,091	658,645	549,077	92,405	14,160	3,003	6,923	4,830	2,093	-	-
Other softwoods	-	-	-	-	-	-	-	-	-	-	403	403	-	-	-	-	-	-	-	-
Total softwoods	268,029	20,617	62,410	59,151	125,851	658,978	189,265	264,987	76,581	128,145	4,443,528	3,489,095	634,863	160,343	159,227	108,282	24,900	3,903	5,821	73,658
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+
Hardwoods																				
Select white oak	20,952	1,688	6,331	3,606	9,327	85,200	25,454	41,627	7,479	10,640	272,824	178,260	65,799	13,140	15,625	44,855	27,462	10,846	3,349	3,198
Select red oak	33,652	3,045	19,448	6,296	4,863	160,395	59,146	64,198	19,179	17,872	535,319	378,008	117,703	13,897	25,711	53,374	22,280	19,786	2,991	8,317
Other red oak	-	-	-	-	-	-	-	-	-	-	10,439	9,357	-	-	1,082	2,015	2,015	-	-	-
Other hickory	-	-	-	-	-	-	-	-	-	-	363	363	-	-	-	-	-	-	-	-
Basswood	151,239	25,109	84,889	25,306	15,935	264,353	167,761	74,076	3,640	18,876	365,424	289,323	63,439	11,456	1,206	10,950	5,779	3,242	-	1,929
Yellow birch	2,330	-	2,330	-	-	4,743	-	4,743	-	-	12,695	4,057	1,937	5,735	966	1,917	1,917	-	-	-
Hard maple	64,966	1,300	49,580	10,348	3,738	148,355	55,696	65,515	20,559	6,585	153,641	106,411	34,190	2,857	10,183	8,511	7,471	1,040	-	-
Soft maple	33,900	1,715	6,357	6,713	19,115	41,498	15,969	13,369	4,992	7,168	90,782	60,220	13,592	4,520	12,450	1,102	1,102	-	-	-
Elm	14,263	2,381	10,109	-	1,773	83,178	22,057	35,591	8,122	17,408	158,843	94,195	35,505	12,599	16,544	-	-	-	-	-
Black ash	53,178	3,783	43,716	5,679	-	154,247	93,100	42,917	4,679	13,551	275,720	251,661	22,431	1,628	-	9,764	9,764	-	-	-
White & green ash	6,984	614	3,514	-	2,856	24,097	12,584	8,775	2,738	-	54,298	42,691	8,882	2,725	-	1,483	1,483	-	-	-
Cottonwood	-	-	-	-	-	-	-	-	-	-	466	466	-	-	-	-	-	-	-	-
Willow	-	-	-	-	-	-	-	-	-	-	343	343	-	-	-	-	-	-	-	-
Balsam poplar	19,638	1,537	12,649	1,713	3,739	90,701	21,239	58,959	1,215	9,288	444,763	351,421	73,566	15,022	4,754	31,022	19,443	10,019	1,560	-
Bigtooth aspen	22,969	5,303	10,603	1,292	5,771	108,785	54,974	44,855	8,211	745	344,429	255,759	80,489	6,242	1,939	14,320	9,503	4,817	-	-
Quaking aspen	135,723	5,663	94,710	17,749	17,601	724,003	363,139	301,150	24,623	35,091	3,338,907	2,515,104	685,585	95,130	43,088	269,295	188,342	77,704	3,249	-
Paper birch	34,556	8,386	20,976	2,383	2,811	147,862	97,256	40,361	2,722	7,523	519,111	470,213	45,218	3,680	-	35,880	28,553	7,327	-	-
Butternut	2,505	-	1,212	-	1,293	-	-	-	-	-	1,096	1,096	-	-	-	-	-	-	-	-
Other hardwoods	-	-	-	-	-	-	-	-	-	-	3,755	3,755	-	-	-	-	-	-	-	-
Total hardwoods	596,855	60,524	366,424	81,085	88,822	2,037,417	988,375	796,136	108,159	144,747	6,583,218	5,012,703	1,248,336	188,631	133,548	484,488	325,114	134,781	11,149	13,444
All species	864,884	81,141	428,834	140,236	214,673	2,696,395	1,177,640	1,061,123	184,740	272,892	11,026,746	8,501,798	1,883,199	348,974	292,775	592,770	350,014	138,684	16,970	87,102

(Table 15 continued on next page)

(Table 15 continued)

Central Hardwood Unit

Species group	Log grade 1					Log grade 2					Log grade 3					Log grade 4				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods																				
Jack pine	507	507	-	-	-	1,894	1,894	-	-	-	38,285	36,720	1,565	-	-	-	-	-	-	-
Red pine	6,171	3,288	335	2,548	-	5,842	1,341	1,837	-	2,664	90,810	67,659	11,646	6,591	4,914	-	-	-	-	-
White pine	8,629	495	2,945	5,189	-	52,398	10,268	11,174	8,948	22,008	34,804	11,896	8,616	1,542	12,750	13,205	1,281	2,990	-	8,934
White spruce	-	-	-	-	-	-	-	-	-	-	16,945	13,948	2,997	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-	-	2,844	2,844	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-	-	27,349	24,834	2,515	-	-	-	-	-	-	-
Tamarack	-	-	-	-	-	2,761	2,761	-	-	-	75,060	72,089	2,971	-	-	6,009	6,009	-	-	-
Eastern redcedar	-	-	-	-	-	-	-	-	-	-	18,868	18,264	604	-	-	-	-	-	-	-
Other softwoods	-	-	-	-	-	-	-	-	-	-	7,307	7,307	-	-	-	-	-	-	-	-
Total softwoods	15,307	4,290	3,280	7,737	-	62,895	16,264	13,011	8,948	24,672	312,272	255,561	30,914	8,133	17,664	19,214	7,290	2,990	-	8,934
	Tree grade [1]					Tree grade [2]					Tree grade [3]					Tie and timber				
	Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)				
	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+
Hardwoods																				
Select white oak	19,176	-	4,107	-	15,069	138,865	26,662	64,781	13,121	34,301	358,031	150,702	108,048	28,785	70,496	418,107	206,730	146,569	37,355	27,453
Select red oak	99,374	-	34,091	20,686	44,597	430,261	80,414	170,695	68,422	110,730	635,918	251,630	182,439	70,169	131,680	542,852	260,963	191,614	40,175	50,100
Other red oak	6,074	-	-	2,295	3,779	13,371	1,066	3,231	6,009	3,065	22,754	9,310	6,601	-	6,843	62,794	24,547	19,578	4,715	13,954
Select hickory	2,193	-	2,193	-	-	8,655	4,048	4,607	-	-	14,739	11,352	3,387	-	-	13,067	10,959	2,108	-	-
Other hickory	-	-	-	-	-	1,310	-	1,310	-	-	2,440	2,440	-	-	-	4,149	-	4,149	-	-
Basswood	141,086	2,168	75,563	31,266	32,089	221,491	109,456	68,974	12,104	30,957	240,656	147,562	42,885	11,760	38,449	23,831	16,022	5,890	-	1,919
Yellow birch	-	-	-	-	-	-	-	-	-	-	963	963	-	-	-	-	-	-	-	-
Hard maple	6,205	1,514	4,691	-	-	47,112	12,400	19,323	11,117	4,272	112,972	56,814	37,063	7,122	11,973	67,365	36,742	10,726	2,866	17,031
Soft maple	9,824	-	-	-	9,824	15,103	9,794	5,309	-	-	78,415	31,938	14,311	16,337	15,829	124,985	25,509	31,784	4,788	62,904
Elm	27,516	2,924	-	5,614	18,978	48,130	17,885	21,258	-	8,987	85,031	52,230	10,858	10,574	11,369	77,393	37,581	26,112	13,700	-
Black ash	9,980	3,546	-	6,434	-	33,956	18,558	13,531	1,867	-	76,329	70,238	1,700	-	4,391	26,752	11,287	15,465	-	-
White & green ash	47,190	3,050	17,617	9,175	17,348	35,749	19,996	5,807	2,674	7,272	68,403	39,969	22,767	2,108	3,559	55,272	43,255	6,412	3,867	1,738
Cottonwood	47,936	-	2,017	6,258	39,661	28,502	2,979	5,302	3,817	16,404	18,160	2,087	5,400	3,378	7,295	6,241	1,145	-	-	5,096
Willow	-	-	-	-	-	-	-	-	-	-	13,477	-	13,477	-	-	22,453	7,559	11,551	-	3,343
Hackberry	-	-	-	-	-	2,796	2,796	-	-	-	4,928	4,928	-	-	-	4,505	4,505	-	-	-
Balsam poplar	-	-	-	-	-	4,519	-	4,519	-	-	11,018	11,018	-	-	-	17,083	15,222	-	1,861	-
Bigtooth aspen	1,877	338	1,539	-	-	16,337	10,166	3,720	-	2,451	99,826	84,076	15,750	-	-	54,352	45,072	9,280	-	-
Quaking aspen	2,949	-	2,949	-	-	131,118	86,093	45,025	-	-	368,097	282,837	72,068	9,325	3,867	219,175	194,925	24,250	-	-
Paper birch	-	-	-	-	-	17,104	9,336	7,768	-	-	49,247	49,247	-	-	-	48,272	44,196	4,076	-	-
Black cherry	-	-	-	-	-	3,260	3,260	-	-	-	16,206	11,450	4,756	-	-	5,294	5,294	-	-	-
Black walnut	-	-	-	-	-	24,051	7,837	10,823	-	5,391	6,519	785	5,734	-	-	8,518	3,625	-	4,893	-
Butternut	-	-	-	-	-	-	-	-	-	-	7,225	7,225	-	-	-	20,863	20,863	-	-	-
Other hardwoods	-	-	-	-	-	-	-	-	-	-	24,504	18,372	6,132	-	-	25,120	14,809	10,311	-	-
Total hardwoods	421,380	13,540	144,767	81,728	181,345	1,221,690	422,746	455,983	119,131	223,830	2,315,858	1,297,173	553,376	159,558	305,751	1,848,443	1,030,810	519,875	114,220	183,538
All species	436,687	17,830	148,047	89,465	181,345	1,284,585	439,010	468,994	128,079	248,502	2,628,130	1,552,734	584,290	167,691	323,415	1,867,657	1,038,100	522,865	114,220	192,472

(Table 15 continued on next page)

(Table 15 continued)

Prairie Unit

Species group	Log grade 1 (softwoods), tree grade 1 (hardwoods)					Log grade 2 (softwoods), tree grade 2 (hardwoods)					Log grade 3 (softwoods), tree grade 3 (hardwoods)					Log grade 4				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)				
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods																				
Jack pine	-	-	-	-	-	-	-	-	-	-	920	920	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-	-	3,702	3,702	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-	-	3,512	3,512	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	3,676	3,676	-	-	-	-	-	-	-	-
Tamarack	-	-	-	-	-	-	-	-	-	-	1,732	1,732	-	-	-	-	-	-	-	-
Eastern redcedar	-	-	-	-	-	1,805	885	920	-	-	8,858	7,241	1,617	-	-	-	-	-	-	-
Total softwoods	-	-	-	-	-	1,805	885	920	-	-	22,400	20,783	1,617	-	-	-	-	-	-	-
	Tree grade [1]					Tree grade [2]					Tree grade [3]					Tie and timber				
	Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)					Diameter class (inches at breast height)				
	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	11.0-14.9	15.0-18.9	19.0-20.9	21.0+
Hardwoods																				
Select white oak	26,780	-	4,035	3,230	19,515	48,461	8,195	22,601	6,317	11,348	156,854	34,565	52,811	26,169	43,309	204,681	97,529	60,912	19,065	27,175
Select red oak	4,416	-	-	4,416	-	27,100	-	13,836	3,066	10,198	47,779	11,823	18,268	4,595	13,093	29,384	16,698	6,120	-	6,566
Other red oak	-	-	-	-	-	-	-	-	-	-	4,596	-	-	-	4,596	1,105	-	-	-	1,105
Select hickory	-	-	-	-	-	-	-	-	-	-	742	742	-	-	-	-	-	-	-	-
Other hickory	-	-	-	-	-	-	-	-	-	-	1,271	1,271	-	-	-	1,446	-	-	1,446	-
Basswood	104,438	-	45,693	5,376	53,369	66,679	28,039	17,970	13,675	6,995	92,012	33,140	35,267	16,053	7,552	6,694	4,644	2,050	-	-
Hard maple	8,464	-	8,464	-	-	11,858	6,000	5,858	-	-	12,297	12,297	-	-	-	7,900	7,900	-	-	-
Soft maple	10,943	-	-	-	10,943	4,879	-	4,879	-	-	6,075	-	-	-	6,075	13,804	7,286	6,518	-	-
Elm	2,641	-	2,641	-	-	21,210	2,668	9,538	-	9,004	23,558	8,580	1,702	5,443	7,833	36,769	9,411	6,420	2,424	18,514
Black ash	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,745	5,745	-	-	-
White & green ash	28,032	-	18,564	-	9,468	38,699	10,138	13,646	6,206	8,709	81,029	40,357	18,397	14,972	7,303	24,631	16,425	8,206	-	-
Cottonwood	25,860	-	-	4,254	21,606	36,632	-	4,905	4,180	27,547	54,639	9,655	9,536	-	35,448	15,109	2,764	4,850	-	7,495
Willow	-	-	-	-	-	7,148	3,710	-	3,438	-	-	-	-	-	-	51,007	26,405	19,799	4,803	-
Hackberry	-	-	-	-	-	4,184	4,184	-	-	-	7,527	7,527	-	-	-	-	-	-	-	-
Balsam poplar	-	-	-	-	-	-	-	-	-	-	15,109	10,085	5,024	-	-	21,279	21,279	-	-	-
Bigtooth aspen	-	-	-	-	-	-	-	-	-	-	316	316	-	-	-	-	-	-	-	-
Quaking aspen	-	-	-	-	-	-	-	-	-	-	48,273	35,727	12,546	-	-	95,063	91,860	3,203	-	-
Paper birch	-	-	-	-	-	-	-	-	-	-	2,435	2,435	-	-	-	-	-	-	-	-
Black cherry	-	-	-	-	-	-	-	-	-	-	2,048	-	2,048	-	-	-	-	-	-	-
Black walnut	-	-	-	-	-	3,497	2,320	-	1,177	-	4,194	1,544	2,650	-	-	-	-	-	-	-
Butternut	-	-	-	-	-	-	-	-	-	-	1,651	1,651	-	-	-	-	-	-	-	-
Other hardwoods	-	-	-	-	-	5,211	-	5,211	-	-	4,505	4,505	-	-	-	25,862	15,116	10,746	-	-
Total hardwoods	211,574	-	79,397	17,276	114,901	275,558	65,254	98,444	38,059	73,801	566,910	216,220	158,249	67,232	125,209	540,479	323,062	128,824	27,738	60,855
All species	211,574	-	79,397	17,276	114,901	277,363	66,139	99,364	38,059	73,801	589,310	237,003	159,866	67,232	125,209	540,479	323,062	128,824	27,738	60,855

[1] Two grading systems were used in Minnesota:
Log grades were used for softwoods throughout the State and for hardwoods in the Aspen-Birch and Northern Pine Units. Tree grades were used for hardwoods in the Central Hardwood and Prairie Units.
[2] International 1/4-inch rule.

Table 16. -- Net volume of growing stock and sawtimber on timberland by Forest Survey Unit, county, and major species group, Minnesota, 1990

Forest Survey Unit and county	Growing stock					Sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					(In thousand board feet)1				
Aspen-Birch Unit										
Carlton	314,830	19,392	62,883	170,623	61,932	588,848	94,935	139,964	275,904	78,045
Cook	696,223	43,733	297,754	308,185	46,551	1,660,290	182,142	795,466	585,628	97,054
Koochiching	1,254,527	47,967	615,923	493,726	96,911	2,334,281	170,007	1,118,523	900,814	144,937
Lake	840,318	97,996	295,841	376,658	69,823	1,855,088	364,487	734,806	637,737	118,058
St. Louis	2,506,001	266,650	773,545	1,320,127	145,679	5,451,391	1,200,007	1,522,402	2,552,104	176,878
Total	5,611,899	475,738	2,045,946	2,669,319	420,896	11,889,898	2,011,578	4,311,161	4,952,187	614,972
Northern Pine Unit										
Aitkin	771,255	22,462	134,400	400,610	213,783	1,707,592	76,346	256,499	920,685	454,062
Becker	423,643	36,727	31,714	244,768	110,434	1,000,722	144,495	71,962	522,004	262,261
Beltrami	920,868	92,419	205,554	520,897	101,998	2,038,972	381,944	400,995	1,092,030	164,003
Cass	1,066,775	178,963	119,076	580,022	188,714	2,613,867	708,414	269,212	1,277,205	359,036
Clearwater	351,565	30,858	36,665	233,331	50,711	777,026	123,064	102,542	446,816	104,604
Crow Wing	479,142	73,574	23,542	234,505	147,521	1,095,793	247,743	49,164	477,938	320,948
Hubbard	457,600	116,763	33,260	238,674	68,903	977,854	357,103	100,867	399,400	120,484
Itasca	1,451,350	199,002	354,918	743,283	154,147	3,620,149	853,970	763,735	1,739,299	263,145
Lake of the Woods	307,883	29,716	128,171	138,604	11,392	555,098	98,248	193,300	245,865	17,685
Mahnomen	138,172	1,692	1,207	95,279	39,994	260,533	7,577	3,124	187,099	62,733
Roseau	161,394	22,371	42,448	85,320	11,255	330,446	81,961	87,359	146,356	14,770
Wadena	95,212	39,415	3,058	30,951	21,788	202,743	95,682	3,511	47,209	56,341
Total	6,624,859	843,962	1,114,013	3,546,244	1,120,640	15,180,795	3,176,547	2,302,270	7,501,906	2,200,072
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	62,436	849	233	19,924	41,430	187,186	1,091	219	45,636	140,240
Benton-Sherburne	71,622	10,706	285	12,367	48,264	178,946	24,175	801	23,052	130,918
Carver-Hennepin-Scott	46,493	-	441	14,569	31,483	168,951	-	941	51,238	116,772
Chisago-Isanti	89,426	13,873	2,832	29,318	43,403	211,040	11,134	4,072	54,478	141,356
Douglas-Todd	129,016	1,440	4,912	51,566	71,098	382,643	5,955	16,120	132,439	228,129
Fillmore-Olmsted	163,447	1,026	2,212	39,923	120,286	548,129	5,594	5,017	111,407	426,111
Goodhue	93,782	1,108	809	41,280	50,585	328,041	4,942	2,450	125,498	195,151
Houston	153,188	1,517	1,931	50,082	99,658	512,930	7,412	2,738	153,105	349,675
Kanabec	132,279	1,873	5,234	71,276	53,896	292,810	8,843	5,587	136,653	141,727
Le Sueur-Rice	49,396	-	698	25,472	23,226	181,223	-	718	94,402	86,103
Mille Lacs	144,213	491	2,109	78,027	63,586	300,113	-	3,084	160,424	136,605
Morrison	197,856	18,729	4,873	100,603	73,651	428,059	65,200	8,405	157,738	196,716
Otter Tail	200,401	2,438	11,198	88,550	98,215	529,429	6,231	34,091	230,997	258,110
Pine	462,896	29,004	30,192	303,767	99,933	874,867	112,026	55,781	513,208	193,852
Stearns	61,795	-	2,770	29,890	29,135	175,087	-	5,859	83,425	85,803
Wabasha	74,695	136	-	29,996	44,563	237,818	666	-	77,715	159,437
Winona	157,509	1,272	747	44,250	111,240	537,186	6,583	2,336	119,474	408,793
Wright	40,477	-	1,174	19,857	19,446	142,601	-	1,617	65,392	75,592
Total	2,330,927	84,462	72,650	1,050,717	1,123,098	6,217,059	259,852	149,836	2,336,281	3,471,090

(Table 16 continued on next page)

(Table 16 continued)

Forest Survey Unit and county	Growing stock					Sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					*(In thousand board feet)*[1]				
Prairie Unit										
Blue Earth-Fairbault	42,483	-	2,029	27,395	13,059	160,457	-	4,412	105,827	50,218
Clay-Norman	50,490	-	-	17,881	32,609	145,407	-	-	44,036	101,371
Eastern Group[2]	50,645	-	102	12,318	38,225	203,447	-	515	42,863	160,069
Kandiyohi-Meeker	43,605	-	272	21,213	22,120	168,224	-	-	83,057	85,167
Kittson	42,598	-	-	28,674	13,924	51,737	-	-	19,784	31,953
Marshall	75,266	-	3,782	58,549	12,935	98,440	-	2,717	61,639	34,084
Northern Group[3]	60,018	-	200	36,525	23,293	229,625	-	544	134,590	94,491
Pennington-Red Lake	47,133	-	-	30,128	17,005	87,529	-	-	41,454	46,075
Polk	67,677	762	98	39,987	26,830	168,257	4,181	530	100,460	63,086
Southern Group[4]	37,678	-	2,327	18,368	16,983	143,659	-	5,192	73,912	64,555
Western Group[5]	47,780	882	412	20,207	26,279	161,944	3,953	2,161	70,360	85,470
Total	565,373	1,644	9,222	311,245	243,262	1,618,726	8,134	16,071	777,982	816,539
All counties	15,133,058	1,405,806	3,241,831	7,577,525	2,907,896	34,906,478	5,456,111	6,779,338	15,568,356	7,102,673

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 17. -- Net volume of all live trees and salvable dead trees on timberland by class of timber and major species group, Minnesota, 1990

(In thousand cubic feet)

Class of timber	All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Live trees					
Growing-stock trees					
Sawtimber					
Saw-log portion	5,669,814	912,549	1,153,854	2,479,646	1,123,765
Upper stem portion	1,683,531	119,391	174,954	964,285	424,901
Total	7,353,345	1,031,940	1,328,808	3,443,931	1,548,666
Poletimber	7,779,713	373,866	1,913,023	4,133,594	1,359,230
All growing-stock trees	15,133,058	1,405,806	3,241,831	7,577,525	2,907,896
Cull trees					
Short-log trees	302,258	7,609	23,961	128,545	142,143
Rough trees [1]					
Sawtimber size	581,278	15,884	50,521	244,881	269,992
Poletimber size	631,113	10,418	71,216	338,051	211,428
Total	1,212,391	26,302	121,737	582,932	481,420
Rotten trees [1]					
Sawtimber size	311,734	3,535	42,798	195,953	69,448
Poletimber size	98,669	552	18,328	64,920	14,869
Total	410,403	4,087	61,126	260,873	84,317
All cull trees	1,925,052	37,998	206,824	972,350	707,880
Salvable dead trees					
Sawtimber size	150,011	8,400	23,343	107,315	10,953
Poletimber size	113,324	3,362	22,387	77,385	10,190
All salvable dead trees	263,335	11,762	45,730	184,700	21,143
All classes	17,321,445	1,455,566	3,494,385	8,734,575	3,636,919

[1] Includes all noncommercial species.

Table 18. -- Net volume of all live trees and growing-stock trees on timberland by ownership class and major species group, Minnesota, 1990

(In thousand cubic feet)

Ownership class	All live trees					Growing-stock trees				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	2,217,641	390,218	613,442	1,065,051	148,930	2,101,445	387,305	591,002	996,726	126,412
Bureau of Land Mgmt.	23,364	5,959	7,405	7,946	2,054	21,885	5,789	7,216	6,826	2,054
Other federal	254,560	18,401	25,207	135,892	75,060	218,397	18,035	24,016	117,292	59,054
State	2,997,887	219,111	1,082,431	1,288,583	407,762	2,714,067	211,999	1,009,845	1,149,591	342,632
County and municipal	2,999,065	223,431	619,056	1,704,133	452,445	2,733,032	216,679	576,176	1,539,670	400,507
Indian	595,043	47,929	168,807	308,129	70,178	541,409	46,785	155,425	277,447	61,752
Forest industry	738,454	89,790	230,067	344,778	73,819	670,586	86,695	214,939	306,602	62,350
Individual	6,561,652	410,061	576,985	3,320,024	2,254,582	5,542,954	395,260	542,615	2,852,523	1,752,556
Corporate	670,444	38,904	125,255	375,339	130,946	589,283	37,259	120,597	330,848	100,579
All owners	17,058,110	1,443,804	3,448,655	8,549,875	3,615,776	15,133,058	1,405,806	3,241,831	7,577,525	2,907,896

Table 19. -- Net volume of growing stock on timberland by forest type group/local type and major species group, Minnesota, 1990

(In thousand cubic feet)

Forest type group/ local type	All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Softwood type groups					
White-red-jack pine					
Jack pine	539,767	439,192	32,043	63,836	4,696
Red pine	527,510	430,678	27,598	61,133	8,101
White pine	128,316	90,069	14,279	22,108	1,860
Total	1,195,593	959,939	73,920	147,077	14,657
Spruce-fir					
Balsam fir	719,528	49,732	449,698	208,203	11,895
White spruce	97,370	8,434	62,880	24,420	1,636
Black spruce	760,814	31,455	657,244	70,248	1,867
Northern white-cedar	794,069	5,651	690,797	70,252	27,369
Tamarack	408,005	6,912	379,077	19,372	2,644
Total	2,779,786	102,184	2,239,696	392,495	45,411
All softwood types	3,975,379	1,062,123	2,313,616	539,572	60,068
Hardwood type groups					
Oak-hickory					
Oak-hickory	1,410,964	32,111	12,573	331,453	1,034,827
Elm-ash-cottonwood					
Elm-ash-soft maple	1,184,661	4,154	140,601	445,026	594,880
Maple-beech-birch					
Maple-basswood	1,744,185	41,761	68,989	940,803	692,632
Aspen-birch					
Aspen	5,370,673	211,127	504,811	4,239,515	415,220
Paper birch	1,050,732	51,499	146,368	768,286	84,579
Balsam poplar	389,951	2,924	53,364	308,896	24,767
Total	6,811,356	265,550	704,543	5,316,697	524,566
All hardwood types	11,151,166	343,576	926,706	7,033,979	2,846,905
Nonstocked	6,513	107	1,509	3,974	923
All forest types	15,133,058	1,405,806	3,241,831	7,577,525	2,907,896

Table 20. -- Average net annual growth of growing stock and sawtimber on timberland by Forest Survey Unit, county, and major species group, Minnesota, 1977-1989

Forest Survey Unit and county	Growing stock					Sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					*(In thousand board feet)* [1]				
Aspen-Birch Unit										
Carlton	9,167	487	1,757	5,132	1,791	24,094	2,885	5,584	12,460	3,165
Cook	11,845	1,402	3,662	5,592	1,189	44,716	6,030	18,046	18,515	2,125
Koochiching	32,438	1,729	13,662	14,565	2,482	90,630	6,950	37,857	40,206	5,617
Lake	18,532	2,847	5,691	8,037	1,957	65,749	10,683	25,003	26,281	3,782
St. Louis	60,318	6,380	18,085	31,387	4,466	221,591	34,094	63,848	115,802	7,847
Total	132,300	12,845	42,857	64,713	11,885	446,780	60,642	150,338	213,264	22,536
Northern Pine Unit										
Aitkin	22,017	1,176	3,788	10,925	6,128	67,484	4,372	10,623	35,824	16,665
Becker	8,298	742	518	3,997	3,041	34,058	4,202	1,656	18,471	9,729
Beltrami	22,639	2,878	3,679	13,080	3,002	79,424	14,167	14,523	44,438	6,296
Cass	26,897	5,609	1,840	14,018	5,430	105,285	24,644	10,416	55,172	15,053
Clearwater	9,632	971	909	6,195	1,557	32,950	4,295	3,655	21,135	3,865
Crow Wing	14,387	2,260	583	7,184	4,360	53,693	10,364	1,895	26,752	14,682
Hubbard	14,547	4,299	778	7,340	2,130	46,235	16,849	2,506	22,519	4,361
Itasca	33,945	6,056	7,482	16,492	3,915	137,776	27,484	28,358	73,005	8,929
Lake of the Woods	8,833	651	3,512	4,227	443	23,723	3,079	8,582	11,410	652
Mahnomen	2,982	78	35	1,787	1,082	10,092	694	69	6,673	2,656
Roseau	5,226	677	1,055	3,105	389	11,961	2,284	3,094	6,055	528
Wadena	4,177	2,267	130	1,143	637	11,238	5,395	278	2,861	2,704
Total	173,580	27,664	24,309	89,493	32,114	613,919	117,829	85,655	324,315	86,120
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	2,214	-3	21	924	1,272	6,589	111	30	1,467	4,981
Benton-Sherburne	2,408	646	8	676	1,078	9,588	2,184	77	1,875	5,452
Carver-Hennepin-Scott	1,202	-	33	591	578	5,287	-	47	1,736	3,504
Chisago-Isanti	2,452	912	32	667	841	6,100	1,185	-128	868	4,175
Douglas-Todd	858	-8	92	-628	1,402	7,625	60	682	-164	7,047
Fillmore-Olmsted	2,959	36	150	721	2,052	14,279	209	207	2,563	11,300
Goodhue	967	33	39	15	880	7,663	318	97	1,739	5,509
Houston	3,112	73	49	864	2,126	15,833	414	255	3,960	11,204
Kanabec	4,032	41	188	2,255	1,548	13,602	201	331	7,150	5,920
Le Sueur-Rice	1,149	-	39	382	728	3,088	-	34	879	2,175
Mille Lacs	3,887	40	87	2,034	1,726	12,670	-	183	6,992	5,495
Morrison	6,086	698	165	3,414	1,809	22,666	4,485	333	10,004	7,844
Otter Tail	2,954	106	67	709	2,072	16,466	643	1,127	5,517	9,179
Pine	13,398	970	820	8,721	2,887	44,103	2,983	3,204	28,678	9,238
Stearns	493	-	17	-154	630	3,484	-	264	499	2,721
Wabasha	1,277	13	-	373	891	6,929	65	-	1,463	5,401
Winona	2,795	43	19	383	2,350	14,091	290	92	1,935	11,774
Wright	599	-	-12	93	518	2,572	-	-47	438	2,181
Total	52,842	3,600	1,814	22,040	25,388	212,635	13,148	6,788	77,599	115,100

(Table 20 continued on next page)

(Table 20 continued)

Forest Survey Unit and county	Growing stock					Sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Prairie Unit	*(In thousand cubic feet)*					*(In thousand board feet)* [1]				
Blue Earth-Fairbault	772	-	133	363	276	2,378	-	275	773	1,330
Clay-Norman	552	-	-	57	495	3,897	-	-	929	2,968
Eastern Group[2]	818	-	8	148	662	4,728	-	43	917	3,768
Kandiyohi-Meeker	809	-	19	293	497	4,197	-	-	2,034	2,163
Kittson	1,036	-	-	707	329	1,206	-	-	-52	1,258
Marshall	2,376	-	181	1,797	398	3,917	-	103	2,927	887
Northern Group[3]	762	-	13	235	514	3,773	-	37	750	2,986
Pennington-Red Lake	1,190	-	-	782	408	4,155	-	-	2,365	1,790
Polk	1,460	5	-6	896	565	5,691	52	-35	3,253	2,421
Southern Group[4]	588	-	62	12	514	1,387	-	203	-563	1,747
Western Group[5]	757	46	16	12	683	3,531	222	91	-40	3,258
Total	11,120	51	426	5,302	5,341	38,860	274	717	13,293	24,576
All counties	369,842	44,160	69,406	181,548	74,728	1,312,194	191,893	243,498	628,471	248,332

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 21. -- Average annual removals of growing stock and sawtimber on timberland by Forest Survey Unit, county, and major species group, Minnesota 1977-1989

Forest Survey Unit and county	Growing stock					Sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					*(In thousand board feet)* [1]				
Aspen-Birch Unit										
Carlton	3,658	185	531	2,359	583	5,991	878	1,185	3,370	558
Cook	9,280	3,026	3,356	2,831	67	26,644	13,373	5,944	7,327	-
Koochiching	25,122	2,100	8,429	13,920	673	53,652	6,647	18,710	26,992	1,303
Lake	10,881	370	3,306	6,916	289	20,546	1,825	5,484	12,921	316
St. Louis	33,416	4,047	6,839	21,241	1,289	72,348	19,032	13,014	38,832	1,470
Total	82,357	9,728	22,461	47,267	2,901	179,181	41,755	44,337	89,442	3,647
Northern Pine Unit										
Aitkin	6,774	101	691	4,975	1,007	19,126	418	1,689	14,037	2,982
Becker	3,026	662	149	1,691	524	8,026	2,830	506	3,343	1,347
Beltrami	14,202	3,362	1,948	8,479	413	37,854	13,266	4,078	19,978	532
Cass	15,224	2,091	1,446	10,317	1,370	33,265	7,509	3,873	19,335	2,548
Clearwater	3,763	406	346	2,869	142	8,446	2,010	1,105	4,776	555
Crow Wing	6,536	1,035	9	3,742	1,750	15,457	3,525	46	8,910	2,976
Hubbard	7,224	1,554	287	5,084	299	14,741	6,647	468	7,122	504
Itasca	28,565	1,369	4,927	20,683	1,586	69,465	6,426	13,364	47,793	1,882
Lake of the Woods	2,090	599	80	1,411	-	5,493	1,537	230	3,726	-
Mahnomen	1,117	98	24	673	322	2,592	390	132	1,238	832
Roseau	833	401	83	209	140	2,284	1,836	315	133	-
Wadena	1,396	516	53	712	115	3,630	1,778	248	1,465	139
Total	90,750	12,194	10,043	60,845	7,668	220,379	48,172	26,054	131,856	14,297
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	287	-	-	39	248	671	-	-	119	552
Benton-Sherburne	736	53	-	261	422	2,371	-	-	986	1,385
Carver-Hennepin-Scott	51	-	-	35	16	163	-	-	163	-
Chisago-Isanti	1,130	136	-	473	521	4,275	747	-	1,495	2,033
Douglas-Todd	888	39	14	645	190	2,944	102	73	2,220	549
Fillmore-Olmsted	1,868	-	-	575	1,293	8,737	-	-	2,559	6,178
Goodhue	1,796	-	-	1,031	765	7,016	-	-	3,914	3,102
Houston	1,779	-	-	123	1,656	8,118	-	-	444	7,674
Kanabec	2,018	-	-	1,408	610	4,849	-	-	2,875	1,974
Le Sueur-Rice	443	-	-	363	80	1,101	-	-	698	403
Mille Lacs	1,329	-	-	898	431	2,923	-	-	1,805	1,118
Morrison	3,180	24	-	2,121	1,035	7,795	-	-	4,082	3,713
Otter Tail	3,607	-	-	2,027	1,580	10,157	-	-	5,692	4,465
Pine	5,486	130	75	4,045	1,236	13,390	408	261	8,193	4,528
Stearns	664	-	-	391	273	2,254	-	-	1,207	1,047
Wabasha	1,255	-	-	600	655	5,803	-	-	2,758	3,045
Winona	2,735	-	-	231	2,504	12,887	-	-	1,098	11,789
Wright	508	-	-	405	103	1,502	-	-	1,185	317
Total	29,760	382	89	15,671	13,618	96,956	1,257	334	41,493	53,872

(Table 21 continued on next page)

(Table 21 continued)

Forest Survey Unit and county	Growing stock					Sawtimber				
	All species	Major species group				All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Prairie Unit	*(In thousand cubic feet)*					*(In thousand board feet)* [1]				
Blue Earth-Fairbault	143	-	-	95	48	555	-	-	353	202
Clay-Norman	1,136	-	-	471	665	3,530	-	-	1,485	2,045
Eastern Group[2]	595	-	-	159	436	2,322	-	-	591	1,731
Kandiyohi-Meeker	15	-	-	15	-	84	-	-	84	-
Kittson	159	-	-	151	8	49	-	-	49	-
Marshall	1,325	-	22	1,024	279	1,126	-	-	587	539
Northern Group[3]	486	-	-	288	198	2,065	-	-	1,111	954
Pennington-Red Lake	467	-	-	353	114	857	-	-	574	283
Polk	2,268	-	-	1,726	542	5,809	-	-	3,830	1,979
Southern Group[4]	120	-	-	77	43	394	-	-	256	138
Western Group[5]	481	-	-	195	286	2,043	-	-	699	1,344
Total	7,195	-	22	4,554	2,619	18,834	-	-	9,619	9,215
All counties	210,062	22,304	32,615	128,337	26,806	515,350	91,184	70,725	272,410	81,031

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 22. -- Average net annual growth and average annual removals of growing stock and sawtimber on timberland by species group, Minnesota, 1977-1989

Species group	Growing stock		Sawtimber	
	Average net annual growth	Average annual removals	Average net annual growth	Average annual removals
	(In thousand cubic feet)		*(In thousand board feet)* [1]	
Softwoods				
Jack pine	11,258	11,827	48,505	40,566
Red pine	23,874	5,246	94,000	24,373
White pine	8,838	5,231	48,421	26,245
White spruce	12,913	4,681	52,414	21,668
Black spruce	11,506	9,651	24,506	11,222
Balsam fir	17,211	13,731	65,840	26,413
Tamarack	12,375	2,126	38,135	4,488
Eastern redcedar	649	-	1,433	-
Northern white-cedar	14,752	2,426	61,170	6,934
Other softwoods	190	-	967	-
Total softwoods	113,566	54,919	435,391	161,909
Hardwoods				
Select white oak	15,014	5,608	58,803	17,307
Select red oak	18,005	11,659	91,792	42,908
Other red oak	417	352	3,470	1,177
Select hickory	448	19	1,512	83
Other hickory	419	32	615	80
Basswood	17,657	5,311	59,232	16,100
Yellow birch	104	32	1,041	-
Hard maple	12,429	2,950	25,189	7,177
Soft maple	15,083	1,777	21,546	1,908
Elm	-11,720	7,437	-42,458	25,571
Black ash	18,684	4,396	39,200	7,127
White & green ash	6,926	1,382	22,681	4,304
Cottonwood	1,205	224	6,717	1,103
Willow	506	259	2,918	763
Hackberry	406	8	531	-
Balsam poplar	9,382	8,227	30,614	15,584
Bigtooth aspen	8,489	3,985	39,376	7,943
Quaking aspen	115,726	81,855	443,100	183,804
Paper birch	23,714	18,913	62,209	18,761
River birch	3	10	-	-
Black cherry	409	250	1,506	447
Black walnut	465	74	1,685	322
Butternut	689	91	3,131	426
Other hardwoods	1,816	292	2,393	546
Total hardwoods	256,276	155,143	876,803	353,441
All species	369,842	210,062	1,312,194	515,350

[1]International 1/4-inch rule.

Table 23. -- Average annual mortality of growing stock and sawtimber on timberland by species group, Minnesota, 1977-1989

Species group	Growing stock average annual mortality	Sawtimber average annual mortality
	(In thousand cubic feet)	*(In thousand board feet)* [1]
Softwoods		
Jack pine	10,340	33,897
Red pine	386	2,009
White pine	992	5,500
White spruce	2,053	8,568
Black spruce	14,078	15,744
Balsam fir	32,256	62,000
Tamarack	4,454	7,678
Eastern redcedar	30	52
Northern white-cedar	1,829	7,145
Total softwoods	66,418	142,593
Hardwoods		
Select white oak	1,004	3,359
Select red oak	7,015	18,511
Other red oak	480	1,254
Select hickory	48	85
Other hickory	39	117
Basswood	3,118	8,898
Yellow birch	278	862
Hard maple	1,074	2,580
Soft maple	2,226	2,073
Elm	27,087	77,010
Black ash	3,800	6,127
White & green ash	525	1,010
Cottonwood	332	1,181
Willow	351	1,035
Hackberry	92	348
Balsam poplar	14,955	30,426
Bigtooth aspen	2,605	5,180
Quaking aspen	67,211	132,963
Paper birch	21,010	20,615
Black cherry	132	178
Black walnut	20	132
Butternut	104	138
Other hardwoods	876	1,350
Total hardwoods	154,382	315,432
All species	220,800	458,025

[1] International 1/4-inch rule.

Table 24. -- Average net annual growth and average annual removals of growing stock and sawtimber on timberland by ownership class and major species group, Minnesota, 1977-1989

Ownership class	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Average annual growth of growing stock				
		Major species group			
	(In thousand cubic feet)				
National forest	49,949	11,576	11,713	23,075	3,585
Bureau of Land Mgmt.	428	88	215	60	65
Other federal	4,534	498	607	2,043	1,386
State	64,046	6,385	19,818	29,210	8,633
County and municipal	66,984	6,490	11,654	37,018	11,822
Indian	12,044	1,385	2,831	6,079	1,749
Forest industry	18,988	3,829	4,723	8,937	1,499
Individual	137,652	12,618	14,945	66,935	43,154
Corporate	15,217	1,291	2,900	8,191	2,835
All owners	369,842	44,160	69,406	181,548	74,728
	Average annual removals of growing stock				
		Major species group			
	(In thousand cubic feet)				
National forest	36,371	4,923	7,963	22,503	982
Bureau of Land Mgmt.	189	180	-	9	-
Other federal	1,156	203	283	606	64
State	33,016	4,828	8,551	18,041	1,596
County and municipal	37,866	3,720	4,799	26,768	2,579
Indian	3,543	1,347	688	1,366	142
Forest industry	18,664	1,639	4,041	11,721	1,263
Individual	67,548	4,385	3,871	39,992	19,300
Corporate	11,709	1,079	2,419	7,331	880
All owners	210,062	22,304	32,615	128,337	26,806
	Average net annual growth of sawtimber				
		Major species group			
	(In thousand board feet) [1]				
National forest	205,532	54,662	53,154	89,114	8,602
Bureau of Land Mgmt.	2,294	891	563	699	141
Other federal	20,430	2,501	1,689	10,478	5,762
State	203,882	26,255	56,946	94,432	26,249
County and municipal	235,112	28,891	41,422	135,955	28,844
Indian	41,954	6,425	9,479	22,490	3,560
Forest industry	59,476	12,284	16,193	27,811	3,188
Individual	489,158	52,959	53,560	219,220	163,419
Corporate	54,356	7,025	10,492	28,272	8,567
All owners	1,312,194	191,893	243,498	628,471	248,332
	Average annual removals of sawtimber				
		Major species group			
	(In thousand board feet) [1]				
National forest	83,545	21,883	17,082	43,739	841
Bureau of Land Mgmt.	641	641	-	-	-
Other federal	3,430	1,001	470	1,656	303
State	79,074	19,165	19,776	37,374	2,759
County and municipal	87,346	15,184	10,679	55,854	5,629
Indian	9,684	6,176	1,112	2,005	391
Forest industry	38,205	4,998	8,298	23,103	1,806
Individual	187,179	17,627	9,523	92,923	67,106
Corporate	26,246	4,509	3,785	15,756	2,196
All owners	515,350	91,184	70,725	272,410	81,031

[1]International 1/4-inch rule.

Table 25. -- Average net annual growth and average annual removals of growing stock and sawtimber on timberland by forest type group/local type and major species group, Minnesota 1977-1989

Forest type group/ local type	Average net annual growth of growing stock					Average annual removals of growing stock				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					(In thousand cubic feet)				
Softwood type groups										
White-red-jack pine										
Jack pine	13,805	10,452	1,047	2,139	167	5,915	3,856	1,196	820	43
Red pine	21,344	18,278	932	1,844	290	11,450	7,748	539	2,685	478
White pine	3,225	2,650	224	314	37	1,472	578	289	594	11
Total	38,374	31,380	2,203	4,297	494	18,837	12,182	2,024	4,099	532
Spruce-fir										
Balsam fir	16,035	1,312	10,111	4,219	393	3,819	171	2,143	1,505	-
White spruce	4,071	452	2,731	826	62	3,544	90	368	2,964	122
Black spruce	16,197	663	13,658	1,838	38	5,265	353	4,664	231	17
Northern white-cedar	8,286	81	8,230	-166	141	1,884	34	1,575	240	35
Tamarack	10,563	228	9,647	509	179	2,669	26	2,607	36	-
Total	55,152	2,736	44,377	7,226	813	17,181	674	11,357	4,976	174
All softwood types	93,526	34,116	46,580	11,523	1,307	36,018	12,856	13,381	9,075	706
Hardwood type groups										
Oak-hickory										
Oak-hickory	29,825	806	582	6,235	22,202	11,215	300	266	2,553	8,096
Elm-ash-cottonwood										
Elm-ash-soft maple	18,006	33	1,386	977	15,610	12,017	75	1,185	6,927	3,830
Maple-beech-birch										
Maple-basswood	32,273	1,287	525	12,783	17,678	20,532	603	1,216	10,988	7,725
Aspen-birch										
Aspen	165,101	6,325	16,530	127,935	14,311	118,678	7,906	13,773	91,196	5,803
Paper birch	21,995	1,408	3,001	14,955	2,631	7,046	253	2,011	4,233	549
Balsam poplar	8,934	150	751	7,089	944	4,065	55	783	3,130	97
Total	196,030	7,883	20,282	149,979	17,886	129,789	8,214	16,567	98,559	6,449
All hardwood types	276,134	10,009	22,775	169,974	73,376	173,553	9,192	19,234	119,027	26,100
Nonstocked	182	35	51	51	45	491	256	-	235	-
All forest types	369,842	44,160	69,406	181,548	74,728	210,062	22,304	32,615	128,337	26,806

Forest type group/ local type	Average net annual growth of sawtimber					Average annual removals of sawtimber				
		Major species group					Major species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand board feet) [1]					(In thousand board feet) [1]				
Softwood type groups										
White-red-jack pine										
Jack pine	53,635	43,851	4,537	4,914	333	14,547	11,718	1,884	945	-
Red pine	77,689	69,468	2,883	4,900	438	35,878	31,269	800	2,886	923
White pine	17,160	14,531	1,122	1,369	138	3,944	3,139	252	499	54
Total	148,484	127,850	8,542	11,183	909	54,369	46,126	2,936	4,330	977
Spruce-fir										
Balsam fir	58,464	6,010	38,158	13,527	769	7,971	860	4,353	2,758	-
White spruce	11,530	1,819	7,321	2,317	73	7,605	347	880	6,329	49
Black spruce	32,897	2,061	26,072	4,691	73	6,646	1,768	4,328	550	-
Northern white-cedar	39,250	516	38,706	-131	159	4,490	205	3,281	975	29
Tamarack	30,710	953	27,533	2,007	217	4,855	98	4,625	132	-
Total	172,851	11,359	137,790	22,411	1,291	31,567	3,278	17,467	10,744	78
All softwood types	321,335	139,209	146,332	33,594	2,200	85,936	49,404	20,403	15,074	1,055
Hardwood type groups										
Oak-hickory										
Oak-hickory	137,997	4,565	1,636	25,147	106,649	38,595	1,360	1,378	6,777	29,080
Elm-ash-cottonwood										
Elm-ash-soft maple	61,110	284	9,521	12,762	38,543	32,013	396	3,867	18,648	9,102
Maple-beech-birch										
Maple-basswood	118,252	7,521	2,861	49,012	58,858	71,969	3,264	3,871	35,419	29,415
Aspen-birch										
Aspen	577,479	32,657	65,754	444,888	34,180	262,042	34,547	33,796	182,838	10,861
Paper birch	69,019	6,913	12,360	43,439	6,307	13,695	1,320	5,188	5,902	1,285
Balsam poplar	26,049	557	4,774	19,197	1,521	9,944	252	2,222	7,237	233
Total	672,547	40,127	82,888	507,524	42,008	285,681	36,119	41,206	195,977	12,379
All hardwood types	989,906	52,497	96,906	594,445	246,058	428,258	41,139	50,322	256,821	79,976
	953	187	260	432	74	1,156	641	-	515	-
All forest types	1,312,194	191,893	243,498	628,471	248,332	515,350	91,184	70,725	272,410	81,031

[1] International 1/4-inch rule.

Table 26. -- All live aboveground tree biomass on timberland by ownership class, major species group, and tree biomass component, Minnesota, 1990

(In green tons)

Ownership class and major species group	All components	Tree biomass component						
		All live 1-5 inch trees	Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
National forest								
Pine	13,578,765	1,009,901	677,253	10,565,937	1,184,922	7,825	119,652	13,275
Other softwoods	30,568,900	8,126,204	1,592,603	15,189,248	4,487,635	99,943	850,371	222,896
Soft hardwoods	54,104,960	6,372,412	2,152,745	31,480,991	9,117,541	242,653	3,731,514	1,007,104
Hard hardwoods	9,936,805	1,865,840	398,223	4,457,360	1,504,734	94,223	1,250,092	366,333
Total	108,189,430	17,374,357	4,820,824	61,693,536	16,294,832	444,644	5,951,629	1,609,608
Bureau of Land Mgmt.								
Pine	197,312	1,080	10,866	159,035	18,447	535	6,535	814
Other softwoods	528,578	268,538	21,356	176,534	53,341	657	7,070	1,082
Soft hardwoods	388,092	25,551	13,416	216,077	57,429	3,516	58,529	13,574
Hard hardwoods	112,704	18,171	6,617	64,470	23,446	-	-	-
Total	1,226,686	313,340	52,255	616,116	152,663	4,708	72,134	15,470
Other federal								
Pine	631,205	34,000	30,167	491,590	53,806	1,130	18,535	1,977
Other softwoods	1,332,196	423,570	66,432	616,972	164,268	4,622	44,621	11,711
Soft hardwoods	6,778,572	644,640	255,722	3,679,477	1,040,859	57,447	876,395	224,032
Hard hardwoods	4,303,473	243,842	188,797	2,127,254	678,399	63,950	781,275	219,956
Total	13,045,446	1,346,052	541,118	6,915,293	1,937,332	127,149	1,720,826	457,676
State								
Pine	7,902,650	739,096	391,783	5,799,748	667,451	18,194	256,808	29,570
Other softwoods	61,928,660	22,351,494	2,831,331	26,046,550	7,084,821	322,619	2,600,176	691,669
Soft hardwoods	67,309,197	9,122,259	2,510,841	36,189,064	10,576,430	439,246	6,673,080	1,798,277
Hard hardwoods	24,769,039	3,603,208	1,069,510	11,883,953	3,911,496	259,848	3,084,708	956,316
Total	161,909,546	35,816,057	6,803,465	79,919,315	22,240,198	1,039,907	12,614,772	3,475,832
County and municipal								
Pine	7,898,393	627,752	385,664	5,925,881	669,793	16,996	244,224	28,083
Other softwoods	32,923,640	9,913,109	1,577,411	15,086,484	4,266,491	174,536	1,517,768	387,841
Soft hardwoods	86,091,848	9,286,677	3,308,105	48,407,060	14,166,351	533,601	8,167,874	2,222,180
Hard hardwoods	27,854,263	4,300,238	1,284,139	13,857,977	4,724,690	217,045	2,633,243	836,931
Total	154,768,144	24,127,776	6,555,319	83,277,402	23,827,325	942,178	12,563,109	3,475,035

(Table 26 continued on next page)

(Table 26 continued)

Ownership class and major species group	All components	Tree biomass component					
		All live 1-5 inch trees	Growing-stock trees			Nongrowing-stock trees	
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Indian								
Pine	1,627,003	75,460	81,261	1,274,464	142,126	3,643	44,665	5,384
Other softwoods	8,360,320	2,397,749	443,402	3,867,422	1,034,685	55,383	446,487	115,192
Soft hardwoods	15,539,548	1,665,315	592,249	8,685,637	2,501,959	99,543	1,581,179	413,666
Hard hardwoods	4,475,222	766,119	203,095	2,110,656	728,900	37,744	479,482	149,226
Total	30,002,093	4,904,643	1,320,007	15,938,179	4,407,670	196,313	2,551,813	683,468
Forest industry								
Pine	3,621,088	654,798	173,439	2,375,563	282,980	8,322	112,573	13,413
Other softwoods	11,521,198	3,218,498	590,280	5,389,476	1,595,402	63,896	521,666	141,980
Soft hardwoods	19,031,992	3,333,215	654,012	9,664,304	2,838,374	123,253	1,887,916	530,918
Hard hardwoods	4,822,599	1,068,724	199,833	2,034,895	712,400	47,892	574,073	184,782
Total	38,996,877	8,275,235	1,617,564	19,464,238	5,429,156	243,363	3,096,228	871,093
Individual								
Pine	14,428,147	1,002,726	729,441	10,813,424	1,253,269	36,407	528,823	64,057
Other softwoods	29,699,049	8,233,236	1,437,169	14,548,280	3,818,713	134,366	1,215,174	312,111
Soft hardwoods	168,190,990	19,181,448	6,310,082	88,441,021	25,800,142	1,453,621	21,263,400	5,741,276
Hard hardwoods	129,786,088	12,003,911	5,420,910	62,368,465	19,550,255	1,802,335	22,188,040	6,452,172
Total	342,104,274	40,421,321	13,897,602	176,171,190	50,422,379	3,426,729	45,195,437	12,569,616
Corporate								
Pine	1,414,639	145,255	66,626	1,015,003	116,245	4,949	57,582	8,979
Other softwoods	6,421,580	1,784,217	328,763	3,168,133	913,920	18,393	165,488	42,666
Soft hardwoods	19,501,575	2,418,859	738,281	10,438,393	3,086,443	140,333	2,115,561	563,705
Hard hardwoods	7,911,433	957,562	318,192	3,543,346	1,160,871	113,279	1,397,583	420,600
Total	35,249,227	5,305,893	1,451,862	18,164,875	5,277,479	276,954	3,736,214	1,035,950
All ownerships								
Pine	51,299,202	4,290,068	2,546,500	38,420,645	4,389,039	98,001	1,389,397	165,552
Other softwoods	183,284,121	56,716,615	8,888,747	84,089,099	23,419,276	874,415	7,368,821	1,927,148
Soft hardwoods	436,936,774	52,050,376	16,535,453	237,202,024	69,185,528	3,093,213	46,355,448	12,514,732
Hard hardwoods	213,971,626	24,827,615	9,089,316	102,448,376	32,995,191	2,636,316	32,388,496	9,586,316
Total	885,491,723	137,884,674	37,060,016	462,160,144	129,989,034	6,701,945	87,502,162	24,193,748

Table 27. -- Area of land by land class, forest type, and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand acres)

Land class	All Units		Aspen-Birch Unit		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
and forest type	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Forest land										
Timberland										
Jack pine	450.8	457.3	107.3	143.1	328.4	295.4	15.1	18.8	-	-
Red pine	243.8	375.3	95.9	135.7	133.8	214.0	14.1	24.5	-	1.1
White pine	68.3	63.7	43.0	33.3	21.6	24.3	3.7	5.1	-	1.0
Balsam fir	820.0	732.8	601.1	544.3	211.3	180.2	7.6	8.3	-	-
White fir	62.9	111.1	45.7	70.1	17.2	40.0	-	1.0	-	-
Black spruce	1,037.0	1,322.1	739.0	943.2	280.2	348.2	17.8	28.7	-	2.0
Northern white-cedar	546.0	681.6	336.1	445.1	209.9	236.5	-	-	-	-
Tamarack	491.1	705.1	159.0	255.3	299.5	403.8	31.6	40.8	1.0	5.2
Oak-hickory	928.7	1,165.6	3.9	9.3	253.9	291.4	597.6	742.1	73.3	122.8
Elm-ash-soft maple	1,006.8	1,289.9	301.2	387.8	375.2	488.0	240.0	311.1	90.4	103.0
Maple-basswood	1,202.4	1,393.1	246.9	261.4	472.1	492.2	394.8	477.6	88.6	161.9
Aspen	5,158.2	5,055.0	1,880.1	1,977.1	2,493.3	2,338.2	538.0	527.8	246.8	211.9
Paper birch	991.2	827.2	548.4	452.0	367.1	319.4	75.7	55.8	-	-
Balsam poplar	547.6	424.7	192.4	156.6	307.5	226.5	13.8	13.7	33.9	27.9
Nonstocked	58.3	118.7	24.3	64.4	27.4	45.9	6.6	5.4	-	3.0
Subtotal	13,613.1	14,723.2	5,324.3	5,878.7	5,798.4	5,944.0	1,956.4	2,260.7	534.0	639.8
Reserved forest land	1,022.9	1,117.4	974.0	1,004.4	34.9	35.5	14.0	69.9	-	7.6
Other forest land	1,901.4	840.5	1,023.7	480.0	720.0	337.6	119.1	13.8	38.6	9.1
All forest land	16,537.4	16,681.1	7,322.0	7,363.1	6,553.3	6,317.1	2,089.5	2,344.4	572.6	656.5
Nonforest land										
Cropland	26,488.2	25,745.6	326.0	315.8	1,938.9	2,136.8	7,300.4	6,817.2	16,922.9	16,475.8
Pasture	1,098.4	1,292.2	97.2	64.8	563.3	411.4	292.3	475.7	145.6	340.3
Other land [1]	6,620.8	7,192.0	888.2	935.6	1,999.6	2,245.2	2,237.0	2,313.4	1,496.0	1,697.8
All nonforest land	34,207.4	34,229.8	1,311.4	1,316.2	4,501.8	4,793.4	9,829.7	9,606.3	18,564.5	18,513.9
Total land	50,744.8	50,910.9	8,633.4	8,679.3	11,055.1	11,110.5	11,919.2	11,950.7	19,137.1	19,170.4

[1]Includes 337.5 thousand acres of water according to FIA standards of area classification, but defined by the Bureau of the Census as land.

Table 28. -- Area of timberland by Forest Survey Unit and county, Minnesota, 1977 and 1990

(In thousand acres)

Forest Survey Unit and county	1977	1990
Aspen-Birch Unit		
Carlton	309.7	340.5
Cook	493.8	565.4
Koochiching	1,276.4	1,423.9
Lake	793.2	850.1
St. Louis	2,451.2	2,698.8
Total	5,324.3	5,878.7
Northern Pine Unit		
Aitkin	671.8	700.5
Becker	320.5	332.3
Beltrami	785.4	835.6
Cass	851.1	841.6
Clearwater	303.8	285.2
Crow Wing	371.2	385.7
Hubbard	429.4	399.8
Itasca	1,301.8	1,323.4
Lake of the Woods	357.7	391.5
Mahnomen	105.3	112.1
Roseau	194.1	217.2
Wadena	106.3	119.1
Total	5,798.4	5,944.0
Central Hardwood Unit		
Anoka-Dakota-Ramsey-Washington	17.0	70.4
Benton-Sherburne	49.3	85.4
Carver-Hennepin-Scott	27.8	44.9
Chisago-Isanti	79.6	101.6
Douglas-Todd	138.2	128.1
Fillmore-Olmsted	111.8	139.3
Goodhue	64.4	68.8
Houston	116.9	133.9
Kanabec	134.5	139.8
Le Sueur-Rice	26.0	42.1
Mille Lacs	127.7	138.4
Morrison	169.3	166.4
Otter Tail	189.8	208.2
Pine	432.8	486.4
Stearns	65.4	69.2
Wabasha	59.8	67.9
Winona	116.9	126.6
Wright	29.2	43.3
Total	1,956.4	2,260.7

(Table 28 continued on next page)

(Table 28 continued)

Forest Survey Unit and county	1977	1990
Prairie Unit		
Blue Earth-Fairbault	31.5	46.5
Clay-Norman	36.6	48.4
Eastern Group[1]	29.1	45.4
Kandiyohi-Meeker	7.6	42.0
Kittson	62.6	65.1
Marshall	138.7	133.3
Northern Group[2]	32.4	49.0
Pennington-Red Lake	67.4	62.1
Polk	83.2	58.5
Southern Group[3]	20.0	36.4
Western Group[4]	24.9	53.1
Total	534.0	639.8
All counties	13,613.1	14,723.2

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca counties.
[2]Includes: McLeod, Nicollet, Renville, and Sibley counties.
[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan counties.
[4]Includes: Big Stone, Chippewa, Grant, Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine counties.

Table 29. -- Area of timberland by Forest Survey Unit and stand-size class, Minnesota, 1977 and 1990

(In thousand acres)

Forest Survey Unit and stand-size class	1977	1990
Aspen-Birch Unit		
Sawtimber	1,075.2	1,502.3
Poletimber	2,705.2	2,169.5
Sapling-seedling	1,519.6	2,142.5
Nonstocked	24.3	64.4
Total	5,324.3	5,878.7
Northern Pine Unit		
Sawtimber	1,349.5	1,942.1
Poletimber	3,153.4	2,259.2
Sapling-seedling	1,268.1	1,696.8
Nonstocked	27.4	45.9
Total	5,798.4	5,944.0
Central Hardwood Unit		
Sawtimber	862.6	1,133.3
Poletimber	861.7	691.8
Sapling-seedling	225.5	430.2
Nonstocked	6.6	5.4
Total	1,956.4	2,260.7
Prairie Unit		
Sawtimber	197.1	312.6
Poletimber	210.2	149.5
Sapling-seedling	126.7	174.7
Nonstocked	-	3.0
Total	534.0	639.8
All Units		
Sawtimber	3,484.4	4,890.3
Poletimber	6,930.5	5,270.0
Sapling-seedling	3,139.9	4,444.2
Nonstocked	58.3	118.7
Total	13,613.1	14,723.2

Table 30. -- Area of land by land-use class and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Land-use class	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwood	Prairie
Forest land					
Timberland	14,723.2	5,878.7	5,944.0	2,260.7	639.8
Reserved forest land	1,117.4	1,004.4	35.5	69.9	7.6
Other forest land	840.5	480.0	337.6	13.8	9.1
All forest land	16,681.1	7,363.1	6,317.1	2,344.4	656.5
Nonforest land					
Nonforest land with trees					
Cropland with trees	18.9	-	6.9	4.4	7.6
Improved pasture with trees	90.3	8.2	32.8	40.8	8.5
Wooded strips	103.3	9.1	22.3	39.1	32.8
Idle farmland with trees	32.9	7.6	16.3	4.0	5.0
Marsh with trees	219.2	39.7	108.1	53.8	17.6
Urban and other with trees	282.3	35.1	93.4	118.5	35.3
Windbreaks	105.9	1.2	6.5	29.3	68.9
Wooded pasture	102.2	4.8	20.8	56.2	20.4
Total	955.0	105.7	307.1	346.1	196.1
Nonforest land without trees					
Cropland	25,726.7	315.8	2,129.9	6,812.8	16,468.2
Improved pasture	1,099.7	51.8	357.8	378.7	311.4
Idle farmland	66.9	15.0	30.3	13.2	8.4
Marsh	3,123.0	393.6	1,517.2	723.1	489.1
Other farm-farmstead	581.6	18.6	41.0	237.1	284.9
Urban and other	2,339.4	338.1	310.4	1,006.4	684.5
Noncensus water	337.5	77.6	99.7	88.9	71.3
Total	33,274.8	1,210.5	4,486.3	9,260.2	18,317.8
All nonforest land	34,229.8	1,316.2	4,793.4	9,606.3	18,513.9
Total land	50,910.9	8,679.3	11,110.5	11,950.7	19,170.4
Census water	3,106.2	715.1	1,437.7	602.4	351.0
Total land and water	54,017.1	9,394.4	12,548.2	12,553.1	19,521.4

Table 31. -- Area of timberland by ownership class, potential productivity class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and ownership class	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Aspen-Birch Unit						
National forest	1,253.9	-	13.5	216.2	414.5	609.7
Bureau of Land Mgmt.	13.5	-	-	-	1.1	12.4
Other federal	32.0	-	1.4	2.0	8.9	19.7
State	1,331.3	0.9	15.1	150.9	273.1	891.3
County and municipal	1,234.4	-	31.2	202.2	425.2	575.8
Indian	102.4	-	-	18.6	27.0	56.8
Forest industry	462.3	-	8.2	110.8	133.9	209.4
Individual	1,107.0	-	18.7	208.0	419.6	460.7
Corporate	341.9	-	4.4	60.9	130.3	146.3
All ownerships	5,878.7	0.9	92.5	969.6	1,833.6	2,982.1
Northern Pine Unit						
National forest	567.2	1.5	27.0	196.3	188.5	153.9
Bureau of Land Mgmt.	12.6	-	-	2.3	5.4	4.9
Other federal	70.5	-	-	10.3	33.0	27.2
State	1,356.9	-	22.9	226.4	409.7	697.9
County and municipal	1,201.7	-	32.7	301.1	502.5	365.4
Indian	373.8	-	4.1	61.8	109.1	198.8
Forest industry	285.0	-	8.8	88.2	127.2	60.8
Individual	1,921.0	1.6	36.6	426.8	785.4	670.6
Corporate	155.3	-	0.8	40.8	70.5	43.2
All ownerships	5,944.0	3.1	132.9	1,354.0	2,231.3	2,222.7
Central Hardwood Unit						
Other federal	55.3	-	1.2	7.5	18.7	27.9
State	298.2	1.3	3.7	69.4	123.7	100.1
County and municipal	59.6	-	-	6.6	38.1	14.9
Indian	7.6	-	-	-	7.1	0.5
Forest industry	4.0	-	-	1.2	1.4	1.4
Individual	1,741.1	2.5	18.3	417.7	771.1	531.5
Corporate	94.9	-	1.2	15.2	39.5	39.0
All ownerships	2,260.7	3.8	24.4	517.6	999.6	715.3
Prairie Unit						
Other federal	13.8	-	-	2.0	9.5	2.3
State	76.1	1.9	-	16.4	30.5	27.3
County and municipal	7.0	-	-	-	4.7	2.3
Individual	522.0	2.0	4.3	86.4	237.6	191.7
Corporate	20.9	-	-	2.0	8.4	10.5
All ownerships	639.8	3.9	4.3	106.8	290.7	234.1
All units						
National forest	1,821.1	1.5	40.5	412.5	603.0	763.6
Bureau of Land Mgmt.	26.1	-	-	2.3	6.5	17.3
Other federal	171.6	-	2.6	21.8	70.1	77.1
State	3,062.5	4.1	41.7	463.1	837.0	1,716.6
County and municipal	2,502.7	-	63.9	509.9	970.5	958.4
Indian	483.8	-	4.1	80.4	143.2	256.1
Forest industry	751.3	-	17.0	200.2	262.5	271.6
Individual	5,291.1	6.1	77.9	1,138.9	2,213.7	1,854.5
Corporate	613.0	-	6.4	118.9	248.7	239.0
All ownerships	14,723.2	11.7	254.1	2,948.0	5,355.2	6,154.2

Table 32. -- Area of privately[1] owned timberland by ownership class, owner tenure, and size of holding, Minnesota, 1990

(In thousand acres)

Ownership class and owner tenure class	All sizes	Size of holding (acres)								
		1-4	5-10	11-20	21-50	51-100	101-500	501-2,500	2,501-5,000	5,001+
Forest industry										
1-4 years	68.7	1.8	-	-	3.4	1.4	1.1	2.6	-	58.4
5-9 years	37.5	-	-	-	1.1	-	-	3.2	-	33.2
10-19 years	129.6	-	-	-	-	3.4	10.0	2.9	7.3	106.0
20+ years	515.5	-	-	-	6.9	5.7	20.7	25.9	7.9	448.4
All owner tenure classes	751.3	1.8	-	-	11.4	10.5	31.8	34.6	15.2	646.0
Individual										
1-4 years	843.8	24.9	44.4	87.5	240.0	214.2	212.1	14.0	4.5	2.2
5-9 years	766.5	29.1	45.8	87.3	263.4	160.9	162.6	14.8	2.6	-
10-19 years	1,834.3	52.7	88.6	157.2	491.0	461.1	519.5	50.6	8.5	5.1
20+ years	1,846.5	45.3	45.9	99.4	462.6	454.4	665.2	58.7	3.4	11.6
All owner tenure classes	5,291.1	152.0	224.7	431.4	1,457.0	1,290.6	1,559.4	138.1	19.0	18.9
Corporate										
1-4 years	84.2	1.1	4.1	5.7	16.5	7.6	13.4	7.7	3.2	24.9
5-9 years	46.4	3.0	0.2	7.4	3.8	4.1	13.0	7.1	-	7.8
10-19 years	141.7	-	-	7.0	5.0	21.3	45.4	16.0	8.4	38.6
20+ years	340.7	-	-	4.2	14.1	18.9	58.3	37.3	19.5	188.4
All owner tenure classes	613.0	4.1	4.3	24.3	39.4	51.9	130.1	68.1	31.1	259.7
All private ownerships										
1-4 years	996.7	27.8	48.5	93.2	259.9	223.2	226.6	24.3	7.7	85.5
5-9 years	850.4	32.1	46.0	94.7	268.3	165.0	175.6	25.1	2.6	41.0
10-19 years	2,105.6	52.7	88.6	164.2	496.0	485.8	574.9	69.5	24.2	149.7
20+ years	2,702.7	45.3	45.9	103.6	483.6	479.0	744.2	121.9	30.8	648.4
All owner tenure classes	6,655.4	157.9	229.0	455.7	1,507.8	1,353.0	1,721.3	240.8	65.3	924.6

[1]Does not include Indian land. Size of holding was not collected for Indian ownership.
Of the 483.8 thousand acres in Indian ownership, 482.6 thousand acres have been held for 20+ years.

Table 33. -- Area of timberland by ownership class, stand-volume class, (board feet)[1] and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and ownership class	All classes	Stand-volume class (board feet)		
		Less than 1,500	1,500-4,999	5,000+
Aspen-Birch Unit				
National forest	1,253.9	614.0	435.2	204.7
Bureau of Land Mgmt.	13.5	11.4	2.1	-
Other federal	32.0	17.1	7.2	7.7
State	1,331.3	840.6	394.8	95.9
County and municipal	1,234.4	683.8	402.4	148.2
Indian	102.4	55.1	31.9	15.4
Forest industry	462.3	280.4	124.3	57.6
Individual	1,107.0	603.4	393.9	109.7
Corporate	341.9	200.9	113.7	27.3
All ownerships	5,878.7	3,306.7	1,905.5	666.5
Northern Pine Unit				
National forest	567.2	224.6	185.1	157.5
Bureau of Land Mgmt.	12.6	3.6	4.9	4.1
Other federal	70.5	19.1	37.5	13.9
State	1,356.9	809.2	408.3	139.4
County and municipal	1,201.7	498.7	499.8	203.2
Indian	373.8	196.2	112.5	65.1
Forest industry	285.0	163.4	90.8	30.8
Individual	1,921.0	776.2	846.2	298.6
Corporate	155.3	66.0	59.9	29.4
All ownerships	5,944.0	2,757.0	2,245.0	942.0
Central Hardwood Unit				
Other federal	55.3	15.2	22.7	17.4
State	298.2	130.0	120.5	47.7
County and municipal	59.6	24.6	21.5	13.5
Indian	7.6	1.0	5.4	1.2
Forest industry	4.0	1.2	-	2.8
Individual	1,741.1	743.4	699.0	298.7
Corporate	94.9	47.1	31.3	16.5
All ownerships	2,260.7	962.5	900.4	397.8
Prairie Unit				
Other federal	13.8	9.6	1.1	3.1
State	76.1	59.3	14.0	2.8
County and municipal	7.0	3.5	2.3	1.2
Individual	522.0	238.4	182.0	101.6
Corporate	20.9	10.6	8.2	2.1
All ownerships	639.8	321.4	207.6	110.8
All units				
National forest	1,821.1	838.6	620.3	362.2
Bureau of Land Mgmt.	26.1	15.0	7.0	4.1
Other federal	171.6	61.0	68.5	42.1
State	3,062.5	1,839.1	937.6	285.8
County and municipal	2,502.7	1,210.6	926.0	366.1
Indian	483.8	252.3	149.8	81.7
Forest industry	751.3	753.3	754.3	755.3
Individual	5,291.1	2,361.4	2,121.1	808.6
Corporate	613.0	324.6	213.1	75.3
All ownerships	14,723.2	7,655.9	5,797.7	2,781.2

[1]International 1/4-inch rule.

Table 34. -- Area of timberland by forest type, stand-size class, and ownership class, Minnesota, 1990

(In thousand acres)

Forest type and stand-size class	All ownerships	National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Jack pine										
Sawtimber	206.4	39.6	0.9	2.2	40.6	40.7	2.3	14.5	60.4	5.2
Poletimber	152.5	19.9	1.1	1.5	27.3	22.9	2.0	24.0	48.7	5.1
Sapling-seedling	98.4	18.6	-	1.3	27.9	9.2	1.5	13.4	24.3	2.2
All stands	457.3	78.1	2.0	5.0	95.8	72.8	5.8	51.9	133.4	12.5
Red pine										
Sawtimber	174.1	64.2	0.9	4.9	28.0	20.7	10.5	13.0	27.8	4.1
Poletimber	85.7	30.6	-	-	20.5	8.9	-	4.1	21.6	-
Sapling-seedling	115.5	23.0	-	-	19.7	32.2	2.1	25.0	11.5	2.0
All stands	375.3	117.8	0.9	4.9	68.2	61.8	12.6	42.1	60.9	6.1
White pine										
Sawtimber	52.8	13.4	-	0.9	5.7	2.0	1.9	5.3	19.1	4.5
Poletimber	8.5	-	-	-	-	2.7	-	0.7	4.5	0.6
Sapling-seedling	2.4	1.9	-	-	-	-	-	-	0.5	-
All stands	63.7	15.3	-	0.9	5.7	4.7	1.9	6.0	24.1	5.1
Balsam fir										
Sawtimber	181.5	48.3	-	-	27.2	48.7	4.2	7.2	39.0	6.9
Poletimber	315.9	83.5	-	1.3	68.3	62.9	4.0	32.8	42.9	20.2
Sapling-seedling	235.4	57.2	-	-	55.2	42.6	4.7	29.7	37.5	8.5
All stands	732.8	189.0	-	1.3	150.7	154.2	12.9	69.7	119.4	35.6
White spruce										
Sawtimber	31.9	6.5	1.0	-	4.7	9.6	1.7	4.3	3.2	0.9
Poletimber	34.9	11.1	-	-	3.4	2.4	1.1	5.3	10.7	0.9
Sapling-seedling	44.3	12.9	-	-	15.7	8.7	-	3.9	3.1	-
All stands	111.1	30.5	1.0	-	23.8	20.7	2.8	13.5	17.0	1.8
Black spruce										
Sawtimber	69.0	18.2	-	2.8	24.5	9.6	2.8	4.2	4.5	2.4
Poletimber	448.4	107.2	1.1	2.3	177.0	62.0	8.0	22.7	54.8	13.3
Sapling-seedling	804.7	123.4	9.2	4.1	360.4	134.4	31.1	35.8	84.1	22.2
All stands	1,322.1	248.8	10.3	9.2	561.9	206.0	41.9	62.7	143.4	37.9
Northern white-cedar										
Sawtimber	298.7	56.3	-	2.4	94.4	54.5	19.9	29.0	32.0	10.2
Poletimber	277.9	28.0	2.4	2.6	131.5	44.3	32.7	14.0	19.1	3.3
Sapling-seedling	105.0	8.8	-	2.8	62.2	13.1	8.0	4.2	4.8	1.1
All stands	681.6	93.1	2.4	7.8	288.1	111.9	60.6	47.2	55.9	14.6
Tamarack										
Sawtimber	102.9	11.1	-	1.4	32.4	15.6	10.7	-	29.0	2.7
Poletimber	252.3	11.4	-	2.2	109.6	46.9	17.1	4.2	53.0	7.9
Sapling-seedling	349.9	9.8	1.0	1.3	179.7	60.8	16.0	4.9	69.0	7.4
All stands	705.1	32.3	1.0	4.9	321.7	123.3	43.8	9.1	151.0	18.0

(Table 34 continued on next page)

(Table 34 continued)

Forest type and stand-size class	All ownerships	National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Oak-hickory										
Sawtimber	780.8	2.7	-	25.4	65.5	22.2	4.3	-	632.3	28.4
Poletimber	299.4	3.3	-	16.4	21.3	26.9	2.2	1.0	216.1	12.2
Sapling-seedling	85.4	4.0	-	-	14.8	3.6	1.6	1.8	56.4	3.2
All stands	1,165.6	10.0	-	41.8	101.6	52.7	8.1	2.8	904.8	43.8
Elm-ash-soft maple										
Sawtimber	404.2	17.6	0.7	15.5	49.5	58.3	7.0	15.8	227.9	11.9
Poletimber	505.5	17.2	0.9	2.8	88.5	98.0	15.6	23.4	241.3	17.8
Sapling-seedling	380.2	24.3	-	0.8	60.0	57.8	17.5	26.3	171.5	22.0
All stands	1,289.9	59.1	1.6	19.1	198.0	214.1	40.1	65.5	640.7	51.7
Maple-basswood										
Sawtimber	763.6	71.5	-	17.3	74.0	91.5	27.1	17.6	439.2	25.4
Poletimber	386.0	20.1	-	5.3	35.7	77.7	10.5	11.5	207.8	17.4
Sapling-seedling	243.5	18.1	-	1.5	18.4	16.7	3.9	20.5	146.8	17.6
All stands	1,393.1	109.7	-	24.1	128.1	185.9	41.5	49.6	793.8	60.4
Aspen										
Sawtimber	1,513.7	211.5	4.7	15.3	208.6	311.8	48.1	56.2	589.5	68.0
Poletimber	1,840.1	200.2	1.1	13.3	332.8	376.6	68.1	76.8	702.2	69.0
Sapling-seedling	1,701.2	230.0	-	7.7	324.1	317.5	44.4	140.1	530.6	106.8
All stands	5,055.0	641.7	5.8	36.3	865.5	1,005.9	160.6	273.1	1,822.3	243.8
Paper birch										
Sawtimber	198.9	35.7	-	3.2	24.9	41.5	11.5	8.4	62.2	11.5
Poletimber	505.8	93.0	-	5.0	59.7	140.9	15.6	16.6	141.6	33.4
Sapling-seedling	122.5	37.1	-	-	21.7	9.9	4.6	8.8	30.1	10.3
All stands	827.2	165.8	-	8.2	106.3	192.3	31.7	33.8	233.9	55.2
Balsam poplar										
Sawtimber	111.8	12.3	-	-	22.6	28.8	-	6.7	37.7	3.7
Poletimber	157.1	1.1	-	2.1	37.6	25.5	13.5	4.1	65.4	7.8
Sapling-seedling	155.8	7.7	-	3.1	45.7	18.8	2.4	10.1	57.9	10.1
All stands	424.7	21.1	-	5.2	105.9	73.1	15.9	20.9	161.0	21.6
Nonstocked	118.7	8.8	1.1	2.9	41.2	23.3	3.6	3.4	29.5	4.9
All forest types										
Sawtimber	4,890.3	608.9	8.2	91.3	702.6	755.5	152.0	182.2	2,203.8	185.8
Poletimber	5,270.0	626.6	6.6	54.8	1,113.2	998.6	190.4	241.2	1,829.7	208.9
Sapling-seedling	4,444.2	576.8	10.2	22.6	1,205.5	725.3	137.8	324.5	1,228.1	213.4
Nonstocked	118.7	8.8	1.1	2.9	41.2	23.3	3.6	3.4	29.5	4.9
All stands	14,723.2	1,821.1	26.1	171.6	3,062.5	2,502.7	483.8	751.3	5,291.1	613.0

Table 35. -- Area of timberland by forest type, stand-size class, and potential productivity class, Minnesota, 1990

(In thousand acres)

Forest type and stand-size class	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Jack pine						
Sawtimber	206.4	-	2.1	18.4	97.1	88.8
Poletimber	152.5	-	0.9	12.5	76.7	62.4
Sapling and seedling	98.4	-	-	8.4	30.3	59.7
All stands	457.3	-	3.0	39.3	204.1	210.9
Red pine						
Sawtimber	174.1	-	17.6	74.6	65.4	16.5
Poletimber	85.7	0.3	25.3	37.0	16.9	6.2
Sapling and seedling	115.5	-	2.8	41.5	52.4	18.8
All stands	375.3	0.3	45.7	153.1	134.7	41.5
White pine						
Sawtimber	52.8	-	1.2	19.7	19.7	12.2
Poletimber	8.5	-	2.6	2.9	1.0	2.0
Sapling and seedling	2.4	-	-	-	2.4	-
All stands	63.7	-	3.8	22.6	23.1	14.2
Balsam fir						
Sawtimber	181.5	-	53.4	90.0	27.5	10.6
Poletimber	315.9	-	50.5	160.7	76.8	27.9
Sapling and seedling	235.4	-	19.2	64.6	74.7	76.9
All stands	732.8	-	123.1	315.3	179.0	115.4
White spruce						
Sawtimber	31.9	-	-	11.0	18.5	2.4
Poletimber	34.9	-	-	10.6	17.9	6.4
Sapling and seedling	44.3	-	-	17.8	17.6	8.9
All stands	111.1	-	-	39.4	54.0	17.7
Black spruce						
Sawtimber	69.0	-	1.1	8.2	13.4	46.3
Poletimber	448.4	-	-	14.5	42.3	391.6
Sapling and seedling	804.7	-	1.4	14.9	22.8	765.6
All stands	1,322.1	-	2.5	37.6	78.5	1,203.5
Northern white-cedar						
Sawtimber	298.7	-	-	3.9	31.9	262.9
Poletimber	277.9	-	-	-	18.4	259.5
Sapling and seedling	105.0	-	-	-	6.1	98.9
All stands	681.6	-	-	3.9	56.4	621.3
Tamarack						
Sawtimber	102.9	-	-	1.1	44.9	56.9
Poletimber	252.3	-	-	8.4	54.7	189.2
Sapling and seedling	349.9	-	-	8.9	61.4	279.6
All stands	705.1	-	-	18.4	161.0	525.7

(Table 35 continued on next page)

(Table 35 continued)

Forest type and stand-size class	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Oak-hickory						
Sawtimber	780.8	1.4	3.1	97.0	334.9	344.4
Poletimber	299.4	-	-	19.0	136.1	144.3
Sapling and seedling	85.4	-	-	9.6	43.5	32.3
All stands	1,165.6	1.4	3.1	125.6	514.5	521.0
Elm-ash-soft maple						
Sawtimber	404.2	-	1.2	42.1	114.9	246.0
Poletimber	505.5	-	-	13.4	56.4	435.7
Sapling and seedling	380.2	-	-	11.7	54.7	313.8
All stands	1,289.9	-	1.2	67.2	226.0	995.5
Maple-basswood						
Sawtimber	763.6	3.9	5.1	97.1	341.7	315.8
Poletimber	386.0	-	-	40.7	139.7	205.6
Sapling and seedling	243.5	1.0	2.3	55.8	105.9	78.5
All stands	1,393.1	4.9	7.4	193.6	587.3	599.9
Aspen						
Sawtimber	1,513.7	1.6	28.6	609.9	777.3	96.3
Poletimber	1,840.1	2.4	18.9	686.1	933.3	199.4
Sapling and seedling	1,701.2	-	11.9	535.0	896.3	258.0
All stands	5,055.0	4.0	59.4	1,831.0	2,606.9	553.7
Paper birch						
Sawtimber	198.9	1.1	0.9	7.2	77.7	112.0
Poletimber	505.8	-	-	10.7	164.2	330.9
Sapling and seedling	122.5	-	-	1.1	28.3	93.1
All stands	827.2	1.1	0.9	19.0	270.2	536.0
Balsam poplar						
Sawtimber	111.8	-	2.3	30.6	59.2	19.7
Poletimber	157.1	-	1.1	22.2	82.1	51.7
Sapling and seedling	155.8	-	0.6	24.0	80.4	50.8
All stands	424.7	-	4.0	76.8	221.7	122.2
Nonstocked	118.7	-	-	5.2	37.8	75.7
All forest types						
Sawtimber	4,890.3	8.0	116.6	1,110.8	2,024.1	1,630.8
Poletimber	5,270.0	2.7	99.3	1,038.7	1,816.5	2,312.8
Sapling and seedling	4,444.2	1.0	38.2	793.3	1,476.8	2,134.9
Nonstocked	118.7	-	-	5.2	37.8	75.7
All stands	14,723.2	11.7	254.1	2,948.0	5,355.2	6,154.2

Table 36. -- Area of timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Aspen-Birch Unit									
Jack pine	143.1	36.5	17.7	37.9	32.6	11.9	5.4	1.1	-
Red pine	135.7	33.1	27.1	29.0	25.9	13.0	4.5	2.5	0.6
White pine	33.3	1.9	0.6	1.1	11.4	6.8	10.3	1.2	-
Balsam fir	544.3	97.4	134.0	176.9	98.1	27.6	9.3	1.0	-
White spruce	70.1	16.0	21.0	18.1	9.1	5.2	-	0.7	-
Black spruce	943.2	75.0	245.7	270.9	191.1	104.8	38.6	6.1	11.0
Northern white-cedar	445.1	12.3	38.3	40.3	93.9	95.7	73.2	42.7	48.7
Tamarack	255.3	41.9	72.6	56.3	32.6	26.5	5.5	13.4	6.5
Oak-hickory	9.3	4.7	-	1.7	1.3	1.6	-	-	-
Elm-ash-soft maple	387.8	78.4	50.0	68.9	87.2	62.4	23.0	10.3	7.6
Maple-basswood	261.4	41.2	31.3	70.3	52.4	40.8	13.7	9.8	1.9
Aspen	1,977.1	572.7	402.0	565.8	365.7	58.7	8.9	1.1	2.2
Paper birch	452.0	40.2	51.0	162.7	162.2	25.8	6.2	3.9	-
Balsam poplar	156.6	44.1	19.2	56.3	27.8	6.2	1.9	1.1	-
Nonstocked	64.4	59.6	2.4	1.3	1.1	-	-	-	-
All forest types	5,878.7	1,155.0	1,112.9	1,557.5	1,192.4	487.0	200.5	94.9	78.5
Northern Pine Unit									
Jack pine	295.4	43.8	57.2	128.8	59.1	6.5	-	-	-
Red pine	214.0	87.2	39.4	30.9	29.1	15.0	10.2	2.2	-
White pine	24.3	1.2	2.3	5.5	11.3	1.2	2.0	0.8	-
Balsam fir	180.2	17.7	43.7	65.3	46.2	7.3	-	-	-
White spruce	40.0	19.8	9.7	1.7	7.3	1.5	-	-	-
Black spruce	348.2	41.1	102.2	99.1	53.1	35.2	10.3	4.9	2.3
Northern white-cedar	236.5	3.8	16.2	25.3	48.7	60.2	35.4	23.3	23.6
Tamarack	403.8	57.0	102.0	65.1	67.2	61.3	17.3	23.3	10.6
Oak-hickory	291.4	21.8	21.9	113.5	83.4	39.3	6.5	5.0	-
Elm-ash-soft maple	488.0	84.3	61.8	96.7	138.0	56.4	33.5	10.0	7.3
Maple-basswood	492.2	27.3	33.4	157.7	162.2	83.9	21.5	5.5	0.7
Aspen	2,338.2	622.0	425.0	768.0	452.6	59.3	10.0	1.3	-
Paper birch	319.4	23.8	35.2	130.3	107.3	16.2	2.2	4.4	-
Balsam poplar	226.5	57.0	63.4	65.9	27.8	12.4	-	-	-
Nonstocked	45.9	39.9	2.2	2.7	1.1	-	-	-	-
All forest types	5,944.0	1,147.7	1,015.6	1,756.5	1,294.4	455.7	148.9	80.7	44.5
Central Hardwood Unit									
Jack pine	18.8	6.2	5.7	5.8	1.1	-	-	-	-
Red pine	24.5	8.6	11.2	4.2	-	0.5	-	-	-
White pine	5.1	0.5	-	1.9	-	2.7	-	-	-
Balsam fir	8.3	2.5	-	4.0	1.8	-	-	-	-
White spruce	1.0	0.8	0.2	-	-	-	-	-	-
Black spruce	28.7	2.6	11.7	6.0	8.4	-	-	-	-
Tamarack	40.8	4.7	17.8	8.2	5.6	3.3	-	1.2	-
Oak-hickory	742.1	27.8	41.3	182.9	233.4	156.5	91.3	7.0	1.9
Elm-ash-soft maple	311.1	68.8	57.9	58.7	82.4	28.4	8.8	5.1	1.0
Maple-basswood	477.6	100.9	41.8	107.5	132.4	64.3	25.2	2.1	3.4
Aspen	527.8	116.5	113.5	212.5	72.0	13.3	-	-	-
Paper birch	55.8	6.9	9.1	26.9	9.9	1.3	1.7	-	-
Balsam poplar	13.7	2.1	4.5	7.1	-	-	-	-	-
Nonstocked	5.4	3.0	-	1.2	1.2	-	-	-	-
All forest types	2,260.7	351.9	314.7	626.9	548.2	270.3	127.0	15.4	6.3

(Table 36 continued on next page)

(Table 36 continued)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Prairie Unit									
Red pine	1.1	-	-	1.1	-	-	-	-	-
White pine	1.0	-	-	-	1.0	-	-	-	-
Black spruce	2.0	-	0.9	1.1	-	-	-	-	-
Tamarack	5.2	4.1	1.1	-	-	-	-	-	-
Oak-hickory	122.8	12.4	6.1	17.1	35.9	30.9	16.6	3.8	-
Elm-ash-soft maple	103.0	15.6	13.7	34.4	27.1	7.6	4.6	-	-
Maple-basswood	161.9	27.8	9.9	28.3	57.6	23.4	13.8	1.1	-
Aspen	211.9	88.4	49.3	56.0	18.2	-	-	-	-
Balsam poplar	27.9	9.5	8.5	9.9	-	-	-	-	-
Nonstocked	3.0	3.0	-	-	-	-	-	-	-
All forest types	639.8	160.8	89.5	147.9	139.8	61.9	35.0	4.9	-
All Units									
Jack pine	457.3	86.5	80.6	172.5	92.8	18.4	5.4	1.1	-
Red pine	375.3	128.9	77.7	65.2	55.0	28.5	14.7	4.7	0.6
White pine	63.7	3.6	2.9	8.5	23.7	10.7	12.3	2.0	-
Balsam fir	732.8	117.6	177.7	246.2	146.1	34.9	9.3	1.0	-
White spruce	111.1	36.6	30.9	19.8	16.4	6.7	-	0.7	-
Black spruce	1,322.1	118.7	360.5	377.1	252.6	140.0	48.9	11.0	13.3
Northern white-cedar	681.6	16.1	54.5	65.6	142.6	155.9	108.6	66.0	72.3
Tamarack	705.1	107.7	193.5	129.6	105.4	91.1	22.8	37.9	17.1
Oak-hickory	1,165.6	66.7	69.3	315.2	354.0	228.3	114.4	15.8	1.9
Elm-ash-soft maple	1,289.9	247.1	183.4	258.7	334.7	154.8	69.9	25.4	15.9
Maple-basswood	1,393.1	197.2	116.4	363.8	404.6	212.4	74.2	18.5	6.0
Aspen	5,055.0	1,399.6	989.8	1,602.3	908.5	131.3	18.9	2.4	2.2
Paper birch	827.2	70.9	95.3	319.9	279.4	43.3	10.1	8.3	-
Balsam poplar	424.7	112.7	95.6	139.2	55.6	18.6	1.9	1.1	-
Nonstocked	118.7	105.5	4.6	5.2	3.4	-	-	-	-
All forest types	14,723.2	2,815.4	2,532.7	4,088.8	3,174.8	1,274.9	511.4	195.9	129.3

Table 37. -- Area of timberland by forest type, site-index class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and forest type	All classes	Site-index class (height in feet of dominant and codominant site trees at 50 years of age)								
		11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
Aspen-Birch Unit										
Jack pine	143.1	-	-	1.3	37.6	48.9	36.9	17.3	1.1	-
Red pine	135.7	0.6	-	4.1	21.6	52.9	33.4	21.6	1.5	-
White pine	33.3	-	-	2.8	16.1	8.6	5.8	-	-	-
Balsam fir	544.3	-	13.4	102.7	212.3	171.0	39.8	5.1	-	-
White spruce	70.1	-	-	6.0	16.9	21.8	19.3	5.1	1.0	-
Black spruce	943.2	16.6	283.2	363.0	226.5	37.1	13.7	3.1	-	-
Northern white-cedar	445.1	80.9	228.8	84.4	31.1	7.0	12.6	0.3	-	-
Tamarack	255.3	5.2	48.2	75.9	70.0	34.9	17.9	3.2	-	-
Oak-hickory	9.3	-	-	2.6	3.4	2.5	0.8	-	-	-
Elm-ash-soft maple	387.8	-	8.8	86.7	133.7	114.4	34.4	7.5	2.3	-
Maple-basswood	261.4	-	2.1	11.0	90.6	110.4	38.4	6.4	2.5	-
Aspen	1,977.1	2.0	-	31.1	120.7	492.1	695.0	480.2	147.1	8.9
Paper birch	452.0	-	-	17.1	122.7	207.4	81.3	22.4	1.1	-
Balsam poplar	156.6	-	-	6.6	21.1	43.1	52.1	26.9	5.9	0.9
Nonstocked	64.4	3.3	4.9	12.7	16.8	15.3	6.1	5.3	-	-
All forest types	5,878.7	108.6	589.4	808.0	1,141.1	1,367.4	1,087.5	604.4	162.5	9.8
Northern Pine Unit										
Jack pine	295.4	-	-	7.9	38.3	107.8	107.1	29.7	4.6	-
Red pine	214.0	-	-	4.6	15.3	63.8	72.9	49.7	7.7	-
White pine	24.3	-	-	-	4.5	7.1	6.9	4.6	1.2	-
Balsam fir	180.2	-	4.9	15.9	46.6	60.9	36.8	11.7	3.4	-
White spruce	40.0	-	-	-	6.7	9.0	9.0	12.3	3.0	-
Black spruce	348.2	8.7	113.5	113.7	78.4	21.3	8.7	2.5	1.4	-
Northern white-cedar	236.5	30.8	98.0	63.8	27.4	8.7	6.6	1.2	-	-
Tamarack	403.8	3.9	67.3	134.0	107.2	64.5	20.9	6.0	-	-
Oak-hickory	291.4	-	2.9	36.5	81.5	88.1	56.7	21.4	2.4	1.9
Elm-ash-soft maple	488.0	-	5.2	82.6	131.2	176.7	64.6	24.6	2.0	1.1
Maple-basswood	492.2	-	-	8.5	77.9	159.9	151.3	81.7	11.9	1.0
Aspen	2,338.2	1.4	0.7	19.0	100.5	328.5	783.4	763.0	320.3	21.4
Paper birch	319.4	-	-	8.8	33.7	102.8	118.1	44.9	11.1	-
Balsam poplar	226.5	-	0.9	12.8	33.8	66.4	67.4	29.5	15.7	-
Nonstocked	45.9	-	4.6	4.9	18.2	14.3	3.3	0.6	-	-
All forest types	5,944.0	44.8	298.0	513.0	801.2	1,279.8	1,513.7	1,083.4	384.7	25.4
Central Hardwood Unit										
Jack pine	18.8	-	-	1.7	1.1	3.6	4.3	6.0	2.1	-
Red pine	24.5	-	-	-	4.7	3.3	6.7	6.7	2.8	0.3
White pine	5.1	-	-	-	-	0.7	2.5	1.9	-	-
Balsam fir	8.3	-	1.4	-	1.6	4.2	1.1	-	-	-
White spruce	1.0	-	-	-	0.2	-	0.8	-	-	-
Black spruce	28.7	-	5.6	7.1	8.3	5.0	2.7	-	-	-
Tamarack	40.8	1.4	-	9.0	19.1	3.2	5.4	2.7	-	-
Oak-hickory	742.1	-	1.4	59.8	167.0	169.6	184.2	112.5	38.5	9.1
Elm-ash-soft maple	311.1	-	3.2	9.7	44.4	82.6	74.1	58.0	28.4	10.7
Maple-basswood	477.6	-	-	5.1	42.4	99.3	139.8	123.7	60.7	6.6
Aspen	527.8	-	-	3.8	16.7	74.0	190.0	167.2	70.2	5.9
Paper birch	55.8	-	-	1.7	4.8	9.0	22.3	16.9	-	1.1
Balsam poplar	13.7	-	-	-	4.3	1.4	2.3	4.5	1.2	-
Nonstocked	5.4	-	-	-	1.2	1.6	1.2	1.4	-	-
All forest types	2,260.7	1.4	11.6	97.9	315.8	457.5	637.4	501.5	203.9	33.7

(Table 37 continued on next page)

(Table 37 continued)

Forest Survey Unit and forest type	All classes	Site-index class (height in feet of dominant and codominant site trees at 50 years of age) 11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
Prairie Unit										
Red pine	1.1	-	-	-	-	-	1.1	-	-	-
White pine	1.0	-	-	-	1.0	-	-	-	-	-
Black spruce	2.0	-	-	-	2.0	-	-	-	-	-
Tamarack	5.2	-	-	-	4.1	-	-	1.1	-	-
Oak-hickory	122.8	-	1.9	22.2	31.9	25.0	27.8	7.4	6.6	-
Elm-ash-soft maple	103.0	-	-	1.1	7.9	21.4	37.0	24.1	10.4	1.1
Maple-basswood	161.9	-	-	3.8	14.8	31.1	46.1	36.7	21.2	8.2
Aspen	211.9	-	-	5.5	24.4	66.1	64.6	48.0	3.3	-
Balsam poplar	27.9	-	-	1.1	7.7	3.3	10.5	5.3	-	-
Nonstocked	3.0	-	-	-	-	3.0	-	-	-	-
All forest types	639.8	-	1.9	33.7	93.8	149.9	187.1	122.6	41.5	9.3
All Units										
Jack pine	457.3	-	-	10.9	77.0	160.3	148.3	53.0	7.8	-
Red pine	375.3	0.6	-	8.7	41.6	120.0	114.1	78.0	12.0	0.3
White pine	63.7	-	-	2.8	21.6	16.4	15.2	6.5	1.2	-
Balsam fir	732.8	-	19.7	118.6	260.5	236.1	77.7	16.8	3.4	-
White spruce	111.1	-	-	6.0	23.8	30.8	29.1	17.4	4.0	-
Black spruce	1,322.1	25.3	402.3	483.8	315.2	63.4	25.1	5.6	1.4	-
Northern white-cedar	681.6	111.7	326.8	148.2	58.5	15.7	19.2	1.5	-	-
Tamarack	705.1	10.5	115.5	218.9	200.4	102.6	44.2	13.0	-	-
Oak-hickory	1,165.6	-	6.2	121.1	283.8	285.2	269.5	141.3	47.5	11.0
Elm-ash-soft maple	1,289.9	-	17.2	180.1	317.2	395.1	210.1	114.2	43.1	12.9
Maple-basswood	1,393.1	-	2.1	28.4	225.7	400.7	375.6	248.5	96.3	15.8
Aspen	5,055.0	3.4	0.7	59.4	262.3	960.7	1,733.0	1,458.4	540.9	36.2
Paper birch	827.2	-	-	27.6	161.2	319.2	221.7	84.2	12.2	1.1
Balsam poplar	424.7	-	0.9	20.5	66.9	114.2	132.3	66.2	22.8	0.9
Nonstocked	118.7	3.3	9.5	17.6	36.2	34.2	10.6	7.3	-	-
All forest types	14,723.2	154.8	900.9	1,452.6	2,351.9	3,254.6	3,425.7	2,311.9	792.6	78.2

Table 38. -- Area of timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand acres)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	206.4	-	-	8.4	3.8	6.0	21.1	12.3	19.7	25.9	28.5	39.4	32.9	8.4	-
Poletimber	152.5	-	-	2.3	-	4.5	5.5	5.6	22.8	14.0	26.6	30.3	30.5	9.6	0.8
Sapling and seedling	98.4	37.6	13.3	17.1	6.1	2.7	5.6	7.3	5.7	3.0	-	-	-	-	-
All stands	457.3	37.6	13.3	27.8	9.9	13.2	32.2	25.2	48.2	42.9	55.1	69.7	63.4	18.0	0.8
Red pine															
Sawtimber	174.1	-	1.2	-	3.9	-	8.5	13.3	11.4	13.4	10.3	28.8	48.8	26.0	8.5
Poletimber	85.7	-	-	1.5	-	6.6	11.4	2.4	5.3	4.1	3.0	18.6	20.1	7.4	5.3
Sapling and seedling	115.5	58.4	15.0	4.0	10.5	14.9	6.6	-	2.4	1.6	1.1	1.0	-	-	-
All stands	375.3	58.4	16.2	5.5	14.4	21.5	26.5	15.7	19.1	19.1	14.4	48.4	68.9	33.4	13.8
White pine															
Sawtimber	52.8	-	-	-	-	1.1	2.6	1.0	3.6	2.2	7.3	12.0	15.2	5.4	2.4
Poletimber	8.5	-	-	-	-	-	-	1.3	2.6	-	-	3.6	-	1.0	-
Sapling and seedling	2.4	-	0.5	-	-	-	1.9	-	-	-	-	-	-	-	-
All stands	63.7	-	0.5	-	-	1.1	4.5	2.3	6.2	2.2	7.3	15.6	15.2	6.4	2.4
Balsam fir															
Sawtimber	181.5	-	0.9	1.1	4.9	8.0	12.6	13.9	16.1	26.5	11.9	40.1	34.7	10.8	-
Poletimber	315.9	-	1.0	12.4	7.3	19.3	30.9	17.6	28.7	29.7	25.4	63.6	58.0	16.5	5.5
Sapling and seedling	235.4	22.9	19.1	38.7	24.5	33.9	35.4	13.2	15.3	10.6	3.3	9.9	8.6	-	-
All stands	732.8	22.9	21.0	52.2	36.7	61.2	78.9	44.7	60.1	66.8	40.6	113.6	101.3	27.3	5.5
White spruce															
Sawtimber	31.9	-	1.1	0.7	1.1	2.2	6.2	-	4.5	2.3	1.3	5.4	4.0	3.1	-
Poletimber	34.9	-	1.2	2.0	-	2.3	6.8	-	5.7	-	1.5	7.4	5.7	2.3	-
Sapling and seedling	44.3	21.3	4.6	3.7	2.4	4.6	2.3	-	5.4	-	-	-	-	-	-
All stands	111.1	21.3	6.9	6.4	3.5	9.1	15.3	-	15.6	2.3	2.8	12.8	9.7	5.4	-
Black spruce															
Sawtimber	69.0	-	4.2	-	5.3	7.5	9.2	5.1	9.1	6.2	5.2	11.0	3.4	2.8	-
Poletimber	448.4	-	2.4	1.1	13.8	29.4	44.2	41.7	45.7	65.5	41.3	81.9	58.7	18.0	4.7
Sapling and seedling	804.7	62.3	93.2	84.9	66.3	110.6	84.4	56.2	65.1	57.6	37.0	60.0	24.8	2.3	-
All stands	1,322.1	62.3	99.8	86.0	85.4	147.5	137.8	103.0	119.9	129.3	83.5	152.9	86.9	23.1	4.7
Northern white-cedar															
Sawtimber	298.7	-	2.6	-	2.5	13.2	13.1	8.4	19.5	23.2	16.8	42.7	75.1	59.3	22.3
Poletimber	277.9	-	2.2	2.5	7.0	2.4	6.2	5.0	14.9	15.4	21.0	47.9	80.1	38.1	35.2
Sapling and seedling	105.0	5.8	6.0	3.7	6.9	12.7	11.3	9.8	15.3	4.3	2.3	21.7	5.2	-	-
All stands	681.6	5.8	10.8	6.2	16.4	28.3	30.6	23.2	49.7	42.9	40.1	112.3	160.4	97.4	57.5
Tamarack															
Sawtimber	102.9	-	6.9	11.4	10.6	16.9	17.5	12.2	5.4	4.1	8.9	5.8	1.1	2.1	-
Poletimber	252.3	-	8.4	8.9	13.9	27.4	33.2	29.1	39.7	31.2	21.5	31.4	6.5	1.1	-
Sapling and seedling	349.9	68.8	45.6	42.2	30.7	46.8	41.2	19.9	21.6	14.8	6.6	8.0	3.7	-	-
All stands	705.1	68.8	60.9	62.5	55.2	91.1	91.9	61.2	66.7	50.1	37.0	45.2	11.3	3.2	-

(Table 38 continued on next page)

(Table 38 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Oak-hickory															
Sawtimber	780.8	1.1	2.3	2.9	6.3	35.2	46.5	43.8	86.7	94.4	91.3	191.9	150.9	25.5	2.0
Poletimber	299.4	-	1.0	4.7	3.2	14.9	37.9	24.1	20.9	38.8	31.2	64.4	52.5	5.8	-
Sapling and seedling	85.4	12.0	10.8	11.4	8.3	16.9	13.6	5.7	4.7	2.0	-	-	-	-	-
All stands	1,165.6	13.1	14.1	19.0	17.8	67.0	98.0	73.6	112.3	135.2	122.5	256.3	203.4	31.3	2.0
Elm-ash-soft maple															
Sawtimber	404.2	-	5.4	11.4	19.5	23.2	31.6	31.4	49.0	48.5	26.1	72.3	61.7	20.4	3.7
Poletimber	505.5	0.9	4.0	13.5	14.5	44.3	31.8	37.0	74.8	60.8	38.3	108.7	59.0	14.0	3.9
Sapling and seedling	380.2	45.4	66.6	78.9	33.3	68.4	46.5	17.6	11.6	3.7	4.2	4.0	-	-	-
All stands	1,289.9	46.3	76.0	103.8	67.3	135.9	109.9	86.0	135.4	113.0	68.6	185.0	120.7	34.4	7.6
Maple-basswood															
Sawtimber	763.6	3.0	2.9	9.6	5.9	14.7	48.1	30.8	64.0	77.7	77.2	184.8	183.4	58.2	3.3
Poletimber	386.0	-	1.9	2.7	1.1	11.2	28.9	14.8	43.9	39.0	41.1	83.1	92.7	23.7	1.9
Sapling and seedling	243.5	12.9	19.1	37.4	21.3	37.3	45.4	25.9	24.2	12.3	5.0	-	2.7	-	-
All stands	1,393.1	15.9	23.9	49.7	28.3	63.2	122.4	71.5	132.1	129.0	123.3	267.9	278.8	81.9	5.2
Aspen															
Sawtimber	1,513.7	-	6.4	20.1	33.0	81.6	95.2	107.3	137.1	175.7	124.1	345.1	271.3	97.6	19.2
Poletimber	1,840.1	-	18.8	24.8	35.8	85.0	158.9	118.4	232.1	242.4	168.7	388.5	257.2	101.1	8.4
Sapling and seedling	1,701.2	287.4	204.9	244.6	176.7	232.1	186.0	116.4	123.7	61.0	32.8	29.0	5.4	1.2	-
All stands	5,055.0	287.4	230.1	289.5	245.5	398.7	440.1	342.1	492.9	479.1	325.6	762.6	533.9	199.9	27.6
Paper birch															
Sawtimber	198.9	2.1	3.4	1.7	3.3	11.0	14.5	21.3	28.0	24.3	17.5	36.7	29.4	5.7	-
Poletimber	505.8	-	1.0	6.3	10.6	16.0	38.7	31.1	59.3	49.4	41.0	103.9	112.2	29.4	6.9
Sapling and seedling	122.5	16.7	12.2	22.2	10.2	14.5	19.8	7.0	8.0	3.6	2.8	2.1	3.4	-	-
All stands	827.2	18.8	16.6	30.2	24.1	41.5	73.0	59.4	95.3	77.3	61.3	142.7	145.0	35.1	6.9
Balsam poplar															
Sawtimber	111.8	-	3.1	4.7	1.2	10.0	4.9	14.4	8.8	10.5	9.6	21.1	13.3	2.6	7.6
Poletimber	157.1	-	1.4	10.4	14.0	25.8	12.5	12.1	13.8	21.4	7.7	23.1	9.2	5.7	-
Sapling and seedling	155.8	37.7	16.6	25.5	13.2	19.8	20.1	10.7	2.7	2.0	5.2	2.3	-	-	-
All stands	424.7	37.7	21.1	40.6	28.4	55.6	37.5	37.2	25.3	33.9	22.5	46.5	22.5	8.3	7.6
Nonstocked	118.7	95.3	16.4	6.1	0.9	-	-	-	-	-	-	-	-	-	-
All forest types															
Sawtimber	4,890.3	6.2	40.4	72.0	101.3	230.6	331.6	315.2	462.9	534.9	436.0	1,037.1	925.2	327.9	69.0
Poletimber	5,270.0	0.9	43.3	93.1	121.2	289.1	446.9	340.2	610.2	611.7	468.3	1,056.4	842.4	273.7	72.6
Sapling and seedling	4,444.2	689.2	527.5	614.3	410.4	615.2	520.1	289.7	305.7	176.5	100.3	138.0	53.8	3.5	-
Nonstocked	118.7	95.3	16.4	6.1	0.9	-	-	-	-	-	-	-	-	-	-
All stands	14,723.2	791.6	627.6	785.5	633.8	1,134.9	1,298.6	945.1	1,378.8	1,323.1	1,004.6	2,231.5	1,821.4	605.1	141.6

Table 39. -- Area of timberland by stocking class based on selected stand components and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Stocking class (percent)	Stocking classified in terms of:			
	All live trees	Growing-stock trees	Rough trees	Rotten trees
Aspen-Birch Unit				
0-10	42.0	55.6	4,995.4	5,365.6
11-20	36.6	58.2	551.3	363.9
21-30	61.3	113.5	194.4	98.1
31-40	108.5	190.4	83.8	35.7
41-50	184.3	285.0	26.8	7.8
51-60	267.3	336.7	12.7	2.5
61-70	367.3	384.7	6.0	5.1
71-80	381.7	478.0	5.7	-
81-90	442.4	481.7	2.6	-
91-100	556.4	595.1	-	-
101-110	664.6	669.5	-	-
111-120	631.7	611.8	-	-
121-130	703.5	543.5	-	-
131-140	562.8	451.1	-	-
141-150	508.9	364.4	-	-
151-160	245.5	176.5	-	-
161+	113.9	83.0	-	-
All classes	5,878.7	5,878.7	5,878.7	5,878.7
Northern Pine Unit				
0-10	28.9	45.9	4,492.9	5,384.1
11-20	41.2	62.9	914.8	388.8
21-30	66.8	119.8	348.9	115.3
31-40	143.7	250.7	125.0	35.7
41-50	211.2	328.6	44.8	15.9
51-60	283.7	407.2	11.4	2.0
61-70	383.8	539.9	5.1	1.1
71-80	473.5	569.9	-	-
81-90	548.2	542.6	1.1	1.1
91-100	592.9	636.5	-	-
101-110	597.4	598.2	-	-
111-120	691.6	588.9	-	-
121-130	684.2	494.3	-	-
131-140	540.3	334.7	-	-
141-150	362.2	236.1	-	-
151-160	201.9	118.3	-	-
161+	92.5	69.5	-	-
All classes	5,944.0	5,944.0	5,944.0	5,944.0
Central Hardwood Unit				
0-10	1.6	17.3	933.5	2,032.6
11-20	10.3	50.9	522.5	177.4
21-30	33.7	77.0	373.2	38.7
31-40	47.9	139.5	197.2	8.4
41-50	77.4	207.9	115.3	3.6
51-60	152.8	251.1	66.8	-
61-70	174.4	314.3	30.6	-
71-80	183.6	318.4	7.7	-
81-90	251.5	266.6	6.2	-
91-100	281.4	192.8	4.3	-
101-110	299.6	164.7	2.6	-
111-120	290.7	137.8	-	-
121-130	190.8	52.9	-	-
131-140	156.3	32.6	-	-
141-150	71.2	20.7	0.8	-
151-160	24.4	9.6	-	-
161+	13.1	6.6	-	-
All classes	2,260.7	2,260.7	2,260.7	2,260.7

(Table 39 continued on next page)

(Table 39 continued)

Stocking class (percent)	Stocking classified in terms of: All live trees	Growing-stock trees	Rough trees	Rotten trees
Prairie Unit				
0-10	-	7.2	236.3	557.8
11-20	5.6	15.7	130.9	56.4
21-30	7.0	15.2	78.1	15.8
31-40	10.1	38.3	87.9	6.6
41-50	14.9	63.4	42.0	2.0
51-60	29.8	64.6	34.3	1.2
61-70	37.3	69.5	21.6	-
71-80	49.0	73.0	5.3	-
81-90	46.8	72.1	-	-
91-100	63.9	73.0	2.4	-
101-110	73.1	44.7	-	-
111-120	93.6	38.7	1.0	-
121-130	82.1	20.1	-	-
131-140	68.1	20.4	-	-
141-150	39.5	15.8	-	-
151-160	16.3	6.9	-	-
161+	2.7	1.2	-	-
All classes	639.8	639.8	639.8	639.8
All Units				
0-10	72.5	126.0	10,658.1	13,340.1
11-20	93.7	187.7	2,119.5	986.5
21-30	168.8	325.5	994.6	267.9
31-40	310.2	618.9	493.9	86.4
41-50	487.8	884.9	228.9	29.3
51-60	733.6	1,059.6	125.2	5.7
61-70	962.8	1,308.4	63.3	6.2
71-80	1,087.8	1,439.3	18.7	-
81-90	1,288.9	1,363.0	9.9	1.1
91-100	1,494.6	1,497.4	6.7	-
101-110	1,634.7	1,477.1	2.6	-
111-120	1,707.6	1,377.2	1.0	-
121-130	1,660.6	1,110.8	-	-
131-140	1,327.5	838.8	-	-
141-150	981.8	637.0	0.8	-
151-160	488.1	311.3	-	-
161+	222.2	160.3	-	-
All classes	14,723.2	14,723.2	14,723.2	14,723.2

Table 40. -- Area of timberland in plantations by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest Survey Unit and forest type	All classes	Stand-age class (years)							
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71+
Aspen-Birch Unit									
Jack pine	24.1	11.4	6.8	2.0	1.5	2.4	-	-	-
Red pine	57.3	20.7	9.7	8.0	10.5	4.7	1.4	1.3	1.0
Balsam fir	9.2	7.7	1.1	-	-	0.4	-	-	-
White spruce	17.2	5.8	2.0	6.1	1.0	2.3	-	-	-
Black spruce	1.2	-	-	1.2	-	-	-	-	-
All types	109.0	45.6	19.6	17.3	13.0	9.8	1.4	1.3	1.0
Northern Pine Unit									
Jack pine	39.3	11.9	6.9	5.4	6.1	2.8	3.6	2.6	-
Red pine	123.9	48.9	32.3	24.9	10.0	3.6	2.7	-	1.5
White pine	1.2	-	1.2	-	-	-	-	-	-
Balsam fir	1.0	-	1.0	-	-	-	-	-	-
White spruce	24.5	15.9	3.9	4.7	-	-	-	-	-
Black spruce	1.4	-	1.4	-	-	-	-	-	-
Tamarack	1.2	1.2	-	-	-	-	-	-	-
Nonstocked	3.0	2.2	0.8	-	-	-	-	-	-
All types	195.5	80.1	47.5	35.0	16.1	6.4	6.3	2.6	1.5
Central Hardwood Unit									
Jack pine	5.2	-	-	1.8	2.6	0.8	-	-	-
Red pine	20.5	1.1	7.5	8.0	1.7	1.6	0.6	-	-
White pine	0.5	0.5	-	-	-	-	-	-	-
Balsam fir	1.1	-	1.1	-	-	-	-	-	-
White spruce	1.0	0.8	-	0.2	-	-	-	-	-
All types	28.3	2.4	8.6	10.0	4.3	2.4	0.6	-	-
Prairie Unit									
White pine	1.0	-	-	-	-	-	-	1.0	-
All types	1.0	-	-	-	-	-	-	1.0	-
All Units									
Jack pine	68.6	23.3	13.7	9.2	10.2	6.0	3.6	2.6	-
Red pine	201.7	70.7	49.5	40.9	22.2	9.9	4.7	1.3	2.5
White pine	2.7	0.5	1.2	-	-	-	-	1.0	-
Balsam fir	11.3	7.7	3.2	-	-	0.4	-	-	-
White spruce	42.7	22.5	5.9	11.0	1.0	2.3	-	-	-
Black spruce	2.6	-	1.4	1.2	-	-	-	-	-
Tamarack	1.2	1.2	-	-	-	-	-	-	-
Nonstocked	3.0	2.2	0.8	-	-	-	-	-	-
All types	333.8	128.1	75.7	62.3	33.4	18.6	8.3	4.9	2.5

Table 41. -- Area of reserved forest land by ownership class and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Ownership class	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwood	Prairie
National forest	775.2	772.2	3.0	-	-
Other federal	111.2	111.2	-	-	-
State	180.7	93.9	27.1	54.9	4.8
County and municipal	27.0	19.3	3.3	4.4	-
Indian	1.3	1.3	-	-	-
Forest industry	1.8	1.8	-	-	-
Individual	17.7	4.7	2.1	8.1	2.8
Corporate	2.5	-	-	2.5	-
All ownerships	1,117.4	1,004.4	35.5	69.9	7.6

Table 42. -- Area of reserved forest land by forest type and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest type	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwood	Prairie
Jack pine	133.0	132.2	-	0.8	-
Red pine	81.7	78.8	2.9	-	-
White pine	3.8	3.8	-	-	-
Balsam fir	93.1	90.7	-	2.4	-
White spruce	39.9	39.9	-	-	-
Black spruce	125.2	113.6	10.6	1.0	-
Northern white-cedar	26.2	25.7	0.5	-	-
Tamarack	10.3	10.3	-	-	-
Oak-hickory	9.5	-	-	9.5	-
Elm-ash-soft maple	48.6	22.3	0.6	18.8	6.9
Maple-basswood	17.5	5.4	6.0	6.1	-
Aspen	425.5	379.7	14.9	30.2	0.7
Paper birch	94.9	94.9	-	-	-
Balsam poplar	7.1	7.1	-	-	-
Nonstocked	1.1	-	-	1.1	-
All types	1,117.4	1,004.4	35.5	69.9	7.6

Table 43. -- Net volume of growing stock on timberland by species group and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand cubic feet)

Species group	All Units		Forest Survey Unit							
			Aspen-Birch		Northern Pine		Central Hardwood		Prairie	
	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Softwoods										
Jack pine	494,834	553,019	134,674	167,032	348,802	371,893	11,026	13,908	332	186
Red pine	403,014	585,215	173,593	180,684	213,792	359,194	15,097	44,681	532	656
White pine	208,300	263,829	112,690	127,938	80,877	112,660	14,733	22,429	-	802
White spruce	200,052	296,414	147,010	204,409	52,879	87,061	163	4,265	-	679
Black spruce	591,622	746,180	461,629	560,964	127,386	175,154	2,121	9,190	486	872
Balsam fir	882,361	963,830	558,929	621,636	317,724	328,531	5,501	13,245	207	418
Tamarack	270,965	475,656	94,094	178,164	169,512	258,549	7,243	36,620	116	2,323
Eastern redcedar	30,760	14,959	65	275	244	424	29,975	9,330	476	4,930
Northern white-cedar	498,844	744,792	305,967	480,498	188,223	264,294	3,236	-	1,418	-
Other softwoods	97	3,743	97	84	-	215	-	3,444	-	-
Total softwoods	3,580,849	4,647,637	1,988,748	2,521,684	1,499,439	1,957,975	89,095	157,112	3,567	10,866
Hardwoods										
Select white oak	458,334	647,392	5,921	9,776	149,517	225,471	220,640	295,784	82,256	116,361
Select red oak	667,323	818,970	10,834	12,388	253,794	304,093	382,792	475,478	19,903	27,011
Other red oak	19,940	36,749	-	128	1,840	5,720	17,408	29,755	692	1,146
Select hickory	11,890	16,348	-	-	-	-	11,890	16,167	-	181
Other hickory	5,119	9,822	-	-	529	629	4,160	7,784	430	1,409
Basswood	498,104	692,132	36,450	49,643	250,536	361,883	171,833	215,909	39,285	64,697
Yellow birch	16,019	21,876	9,789	14,237	5,594	7,158	636	270	-	211
Hard maple	287,345	403,671	69,003	116,363	128,609	183,857	78,081	89,881	11,652	13,570
Soft maple	176,977	345,140	38,536	102,253	77,772	136,331	56,086	98,223	4,583	8,333
Elm	541,680	269,571	52,374	18,739	199,092	122,529	217,802	98,853	72,412	29,450
Black ash	494,967	700,461	186,395	258,256	241,285	344,131	61,980	91,156	5,307	6,918
White & green ash	113,536	186,757	6,193	8,887	26,850	44,676	52,067	78,245	28,426	54,949
Cottonwood	27,494	52,385	417	762	85	156	13,181	21,623	13,811	29,844
Willow	22,277	29,374	-	174	80	173	8,359	10,075	13,838	18,952
Hackberry	5,191	9,885	-	-	-	-	3,042	5,741	2,149	4,144
Balsam poplar	596,928	595,247	242,067	243,228	310,074	304,616	14,462	16,904	30,325	30,499
Bigtooth aspen	215,647	279,740	39,958	43,309	132,076	168,591	43,575	67,268	38	572
Quaking aspen	3,236,100	3,818,495	1,214,778	1,504,046	1,634,498	1,823,337	278,056	370,401	108,768	120,711
Paper birch	1,344,224	1,458,718	642,782	706,851	583,930	625,345	114,333	123,985	3,179	2,537
Black cherry	12,445	15,688	78	314	1,227	1,557	9,955	12,913	1,185	904
Black walnut	8,199	14,163	-	-	-	-	6,650	11,522	1,549	2,641
Butternut	8,804	11,150	-	-	1,829	1,726	6,855	8,822	120	602
Other hardwoods	28,782	51,687	90	861	2,037	4,905	13,613	27,056	13,042	18,865
Total hardwoods	8,797,325	10,485,421	2,555,665	3,090,215	4,001,254	4,666,884	1,787,456	2,173,815	452,950	554,507
All species	12,378,174	15,133,058	4,544,413	5,611,899	5,500,693	6,624,859	1,876,551	2,330,927	456,517	565,373

Table 44. -- Net volume of sawtimber on timberland by species group and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand board feet)[1]

Species group	All Units		Forest Survey Unit							
			Aspen-Birch		Northern Pine		Central Hardwood		Prairie	
	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Softwoods										
Jack pine	1,383,295	1,706,422	435,624	576,837	920,023	1,087,979	26,367	40,686	1,281	920
Red pine	1,797,329	2,444,196	739,321	785,692	1,012,480	1,551,979	42,563	102,823	2,965	3,702
White pine	1,001,053	1,297,353	548,094	648,619	380,599	536,186	72,360	109,036	-	3,512
White spruce	781,381	1,152,492	573,447	808,133	196,415	323,738	9,193	16,945	2,326	3,676
Black spruce	505,488	709,531	390,068	540,302	113,011	166,385	2,409	2,844	-	-
Balsam fir	1,376,996	1,859,325	789,816	1,129,014	577,628	702,962	9,552	27,349	-	-
Tamarack	404,834	835,291	116,350	335,588	229,446	414,141	58,486	83,830	552	1,732
Eastern redcedar	6,777	29,531	-	-	-	-	4,276	18,868	2,501	10,663
Northern white-cedar	1,336,476	2,193,168	878,400	1,498,124	458,076	695,044	-	-	-	-
Other softwoods	3,413	8,140	480	430	-	403	2,933	7,307	-	-
Total softwoods	8,597,042	12,235,449	4,471,600	6,322,739	3,887,678	5,478,817	228,139	409,688	9,625	24,205
Hardwoods										
Select white oak	1,193,311	1,823,231	14,191	28,445	266,761	423,831	642,240	934,179	270,119	436,776
Select red oak	1,878,563	2,638,204	23,672	38,380	484,026	782,740	1,298,697	1,708,405	72,168	108,679
Other red oak	69,326	123,676	-	528	3,123	12,454	63,124	104,993	3,079	5,701
Select hickory	23,898	39,396	-	-	-	-	23,898	38,654	-	742
Other hickory	5,974	10,979	-	-	371	363	4,600	7,899	1,003	2,717
Basswood	1,216,185	1,822,679	68,131	133,826	460,899	791,966	521,730	627,064	165,425	269,823
Yellow birch	57,793	72,782	41,613	50,134	14,936	21,685	1,244	963	-	-
Hard maple	660,642	804,576	108,755	154,930	300,784	375,473	216,169	233,654	34,934	40,519
Soft maple	272,273	503,438	22,938	72,128	88,637	167,282	143,633	228,327	17,065	35,701
Elm	1,569,114	638,862	155,589	60,330	452,942	256,284	678,533	238,070	282,050	84,178
Black ash	600,817	968,817	209,522	323,146	302,096	492,909	85,279	147,017	3,920	5,745
White & green ash	237,477	485,137	6,004	19,270	33,168	86,862	114,910	206,614	83,395	172,391
Cottonwood	128,243	235,374	884	1,829	-	466	64,129	100,839	63,230	132,240
Willow	61,301	95,126	-	698	-	343	29,003	35,930	32,298	58,155
Hackberry	14,157	23,940	-	-	-	-	7,443	12,229	6,714	11,711
Balsam poplar	1,039,102	1,157,379	415,479	502,247	573,689	586,124	18,514	32,620	31,420	36,388
Bigtooth aspen	391,526	752,257	77,096	89,046	235,073	490,503	79,357	172,392	-	316
Quaking aspen	5,222,003	8,652,491	1,981,284	3,319,888	2,790,533	4,467,928	379,069	721,339	71,117	143,336
Paper birch	1,088,816	1,626,662	516,988	772,195	501,834	737,409	66,984	114,623	3,010	2,435
Black cherry	19,349	26,808	-	-	-	-	17,164	24,760	2,185	2,048
Black walnut	26,571	46,779	-	-	-	-	22,584	39,088	3,987	7,691
Butternut	22,159	33,340	-	-	3,255	3,601	18,272	28,088	632	1,651
Other hardwoods	45,694	89,096	-	139	3,770	3,755	20,191	49,624	21,733	35,578
Total hardwoods	15,844,294	22,671,029	3,642,146	5,567,159	6,515,897	9,701,978	4,516,767	5,807,371	1,169,484	1,594,521
All species	24,441,336	34,906,478	8,113,746	11,889,898	10,403,575	15,180,795	4,744,906	6,217,059	1,179,109	1,618,726

[1] International 1/4-inch rule.

Table 45. -- Net volume of all live trees[1] on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Jack pine	572,822	78,986	138,142	149,726	103,750	62,344	25,078	9,949	2,864	1,983	-
Red pine	590,627	56,882	83,042	80,683	75,934	75,516	70,138	59,730	44,017	44,582	103
White pine	275,586	10,095	15,113	20,457	25,235	28,126	25,170	26,563	29,074	74,125	21,628
White spruce	300,378	34,663	47,272	48,882	50,415	37,322	31,090	23,261	15,196	12,277	-
Black spruce	758,041	383,502	237,522	95,227	28,488	6,569	3,983	989	599	1,070	92
Balsam fir	985,689	298,563	296,617	212,755	114,458	40,923	15,203	4,146	1,724	1,300	-
Tamarack	502,705	170,795	154,421	93,922	47,134	21,488	9,891	1,948	2,036	1,070	-
Eastern redcedar	17,613	4,213	6,815	2,445	2,311	748	418	455	-	208	-
Northern white-cedar	884,187	155,003	213,181	192,036	131,560	90,436	50,463	24,749	14,711	11,862	186
Other softwoods	4,769	1,096	1,480	901	447	547	235	-	-	63	-
Total softwoods	4,892,417	1,193,798	1,193,605	897,034	579,732	364,019	231,669	151,790	110,221	148,540	22,009
Hardwoods											
Select white oak	851,315	72,129	96,989	119,189	122,604	107,923	94,504	77,359	48,183	90,570	21,865
Select red oak	951,519	34,364	88,281	148,049	151,315	135,440	120,585	90,071	63,588	101,761	18,065
Other red oak	55,941	2,565	6,189	3,810	7,159	6,896	7,405	4,148	5,619	10,528	1,622
Select hickory	18,954	1,470	2,891	3,174	4,078	3,368	1,998	1,031	601	343	-
Other hickory	11,824	2,416	3,282	2,198	1,527	1,178	349	442	266	166	-
Basswood	775,199	72,904	110,587	144,314	121,200	102,639	74,756	57,198	33,859	50,725	7,017
Yellow birch	36,017	2,441	3,714	4,077	4,384	6,303	3,601	3,635	2,959	4,366	537
Hard maple	535,012	102,336	95,068	78,487	70,581	57,575	49,521	33,755	21,308	24,389	1,992
Soft maple	456,884	123,165	98,706	72,142	40,790	29,970	20,726	15,636	13,470	25,010	17,269
Elm	327,571	46,028	52,006	50,384	46,981	30,991	29,122	19,901	16,526	27,324	8,308
Black ash	747,345	162,619	196,855	158,928	107,236	63,536	30,232	15,286	6,367	5,429	857
White & green ash	227,548	20,895	32,437	41,088	36,645	30,353	21,842	14,669	11,173	14,625	3,821
Cottonwood	56,422	491	1,291	2,775	3,088	2,552	3,832	3,536	4,738	14,429	19,690
Willow	45,458	986	3,147	5,714	6,629	6,474	5,150	5,562	2,720	5,811	3,265
Hackberry	13,746	2,449	1,880	1,812	1,364	1,939	1,199	1,247	498	1,157	201
Balsam poplar	633,082	80,999	128,708	148,270	113,811	76,383	42,813	24,028	9,701	7,909	460
Bigtooth aspen	313,957	17,596	40,156	67,291	76,717	54,640	31,379	16,124	6,634	3,298	122
Quaking aspen	4,284,334	415,626	711,566	949,713	897,039	640,380	373,669	168,944	69,072	56,992	1,333
Paper birch	1,596,444	317,103	455,836	388,772	229,190	114,748	50,851	24,344	7,604	7,345	651
Black cherry	26,654	5,229	7,248	5,274	3,549	2,704	1,492	777	322	59	-
Black walnut	16,584	222	2,868	1,789	2,430	2,535	3,006	1,956	919	859	-
Butternut	20,124	491	2,981	2,925	3,667	2,559	2,741	2,633	894	1,032	201
Other hardwoods	131,568	16,477	23,513	24,451	19,091	16,923	10,362	7,259	5,320	6,458	1,714
Total hardwoods	12,133,502	1,501,001	2,166,199	2,424,626	2,071,075	1,498,009	981,135	589,541	332,341	460,585	108,990
Noncommercial species	32,191	20,221	7,271	2,774	920	434	-	151	-	253	167
All species	17,058,110	2,715,020	3,367,075	3,324,434	2,651,727	1,862,462	1,212,804	741,482	442,562	609,378	131,166

[1] Net volume of all live trees 5 inches d.b.h. and larger from a 1-foot stump to a 4-inch top diameter outside bark.

Table 46. -- Net volume of tree species on timberland by major tree class and individual species, Minnesota, 1990

Individual species	Total all live	Major tree class: All live trees: Growing stock	All live trees: Short-log	All live trees: Rough	All live trees: Rotten	Total saw-log size trees	Saw-log size trees: Sawtimber	Saw-log size trees: Short-log
	Thousand cubic feet					*Thousand board feet* [1]		
Jack pine	572,822	553,019	3,541	15,024	1,238	1,718,597	1,706,422	12,175
Red pine	590,627	585,215	1,702	3,561	149	2,450,666	2,444,196	6,470
White pine	275,586	263,829	2,186	6,871	2,700	1,304,933	1,297,353	7,580
Ponderosa pine	641	625	-	16	-	123	123	-
White spruce	300,378	296,414	562	2,838	564	1,155,237	1,152,492	2,745
Black spruce	758,041	746,180	445	10,583	833	710,981	709,531	1,450
Balsam fir	985,689	963,830	2,547	16,446	2,866	1,866,546	1,859,325	7,221
Tamarack	502,705	475,656	2,865	19,205	4,979	847,140	835,291	11,849
Eastern redcedar	17,613	14,959	268	2,207	179	30,799	29,531	1,268
Northern white-cedar	884,187	744,792	17,274	70,458	51,663	2,253,452	2,193,168	60,284
Scotch pine	4,128	3,118	180	830	-	8,853	8,017	836
Total softwoods	4,892,417	4,647,637	31,570	148,039	65,171	12,347,327	12,235,449	111,878
White oak	108,934	80,122	9,365	17,356	2,091	305,508	282,075	23,433
Swamp white oak	725	526	-	199	-	857	857	-
Bur oak	741,698	566,744	51,733	116,610	6,611	1,667,137	1,540,299	126,838
Northern red oak	951,519	818,970	32,267	82,859	17,423	2,707,639	2,638,204	69,435
Northern pin oak	45,860	30,146	3,540	10,502	1,672	103,859	96,047	7,812
Black oak	10,081	6,603	305	2,816	357	28,235	27,629	606
Shagbark hickory	18,954	16,348	858	1,617	131	41,333	39,396	1,937
Bitternut hickory	11,824	9,822	319	1,683	-	11,699	10,979	720
American basswood	775,199	692,132	19,166	47,758	16,143	1,863,111	1,822,679	40,432
Yellow birch	36,017	21,876	1,956	5,702	6,483	77,469	72,782	4,687
Black maple	1,679	455	484	640	100	1,811	723	1,088
Sugar maple	533,333	403,216	17,135	84,227	28,755	842,516	803,853	38,663
Red maple	368,160	276,314	5,605	69,239	17,002	241,220	227,484	13,736
Silver maple	88,724	68,826	6,961	11,179	1,758	295,140	275,954	19,186
American elm	291,068	240,818	12,783	33,676	3,791	600,407	567,694	32,713
Siberian elm	811	362	209	223	17	780	269	511
Slippery elm	32,590	25,562	1,789	4,997	242	70,240	65,587	4,653
Rock elm	3,102	2,829	-	210	63	5,312	5,312	-
Black ash	747,345	700,461	5,562	34,893	6,429	981,444	968,817	12,627
White ash	10,489	7,531	1,325	1,505	128	21,826	18,665	3,161
Green ash	217,059	179,226	8,868	24,238	4,727	485,649	466,472	19,177
Eastern cottonwood	56,422	52,385	1,395	1,755	887	240,610	235,374	5,236
Black willow	45,458	29,374	3,160	10,932	1,992	105,527	95,126	10,401
Hackberry	13,746	9,885	1,420	2,338	103	27,620	23,940	3,680
Balsam poplar	633,082	595,247	3,088	24,306	10,441	1,164,959	1,157,379	7,580
Bigtooth aspen	313,957	279,740	3,383	19,721	11,113	757,835	752,257	5,578
Quaking aspen	4,284,334	3,818,495	49,604	238,941	177,294	8,758,174	8,652,491	105,683
Paper birch	1,596,444	1,458,718	17,862	101,735	18,129	1,667,956	1,626,662	41,294
River birch	151	37	89	-	25	319	-	319
Black cherry	26,654	15,688	723	9,431	812	28,356	26,808	1,548
Black walnut	16,584	14,163	988	1,250	183	49,084	46,779	2,305
Butternut	20,124	11,150	1,397	6,491	1,086	36,622	33,340	3,282
Boxelder	125,114	49,081	6,395	60,659	8,979	101,786	82,731	19,055
Kentucky coffeetree	903	871	-	-	32	1,348	1,348	-
Red mulberry	68	-	-	68	-	-	-	-
Black locust	5,290	1,698	954	2,405	233	7,770	5,017	2,753
Noncommercial species	32,191	-	-	32,191	-	-	-	-
Total hardwoods	12,165,693	10,485,421	270,688	1,064,352	345,232	23,301,158	22,671,029	630,129
All species	17,058,110	15,133,058	302,258	1,212,391	410,403	35,648,485	34,906,478	742,007

[1] International 1/4-inch rule

Table 47. -- Net volume of noncommercial tree species on timberland by individual species, Minnesota, 1990

(In thousand cubic feet)

Noncommerical tree species	Nongrowing-stock volume
Striped maple	115
Mountain maple	121
American hornbeam	1,054
Hawthorn	478
Apple	133
Eastern hophornbeam	12,714
Pincherry	311
Chokecherry	326
Wild plum	194
Mountain ash	379
Peachleaf willow	286
Ailanthus	163
Others	15,917
All noncommercial tree species	32,191

Table 48. -- Net volume of growing stock on timberland by species group and forest type, Minnesota, 1990

(In thousand cubic feet)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	553,019	386,914	29,220	2,874	11,028	3,195	21,668	278	2,013	14,776	1,355	3,225	66,562	9,138	666	107
Red pine	585,215	42,337	369,374	14,384	17,302	2,443	5,619	876	2,099	10,127	526	7,221	88,937	22,352	1,618	-
White pine	263,829	7,450	32,084	72,811	21,402	2,661	4,168	4,497	2,800	6,333	2,273	31,315	55,386	20,009	640	-
White spruce	296,414	9,079	8,920	6,403	53,802	47,921	5,274	5,802	1,216	1,945	20,089	13,382	90,153	23,643	8,713	72
Black spruce	746,180	9,361	2,981	1,255	55,473	3,599	519,697	50,802	42,849	-	6,392	1,453	43,248	7,155	1,901	14
Balsam fir	963,830	12,881	13,836	5,757	284,099	8,330	34,569	46,714	8,206	1,048	60,809	34,918	328,679	94,276	29,708	-
Tamarack	475,656	722	723	104	12,316	108	80,480	28,508	313,471	-	14,391	405	14,991	3,481	4,552	1,404
Eastern redcedar	14,959	-	-	-	-	-	424	-	-	9,580	87	3,614	644	610	-	-
Northern white-cedar	744,792	-	1,138	760	44,008	2,922	16,800	558,971	13,335	-	38,833	15,217	27,096	17,203	8,490	19
Other softwoods	3,743	2,491	-	-	-	135	-	-	-	875	-	-	242	-	-	-
Total softwoods	4,647,637	471,235	458,276	104,348	499,430	71,314	688,699	696,448	385,989	44,684	144,755	110,750	715,938	197,867	56,288	1,616
Hardwoods																
Select white oak	647,392	1,625	4,078	555	875	242	-	84	190	382,019	30,754	99,133	116,707	10,025	962	143
Select red oak	818,970	2,948	2,263	601	304	-	289	-	673	535,853	5,015	104,866	135,449	29,279	1,430	-
Other red oak	36,749	-	327	-	-	-	-	-	-	29,038	267	2,788	2,998	1,035	296	-
Select hickory	16,348	-	-	-	-	-	-	-	-	14,204	-	1,127	195	822	-	-
Other hickory	9,822	-	-	-	-	-	-	-	-	6,011	334	3,278	53	146	-	-
Basswood	692,132	280	1,172	70	877	-	-	165	98	70,211	41,431	458,589	102,055	15,345	1,839	-
Yellow birch	21,876	-	-	-	494	449	56	2,288	-	217	4,639	11,295	1,102	1,052	284	-
Hard maple	403,671	-	759	310	501	401	74	428	-	20,484	13,445	303,523	46,519	15,814	1,413	-
Soft maple	345,140	1,023	1,414	3,852	4,439	1,144	1,940	462	744	15,899	85,190	78,848	119,053	30,283	849	-
Elm	269,571	-	192	218	927	67	373	74	1,027	41,537	60,738	105,199	45,941	9,064	4,134	80
Black ash	700,461	123	393	150	9,488	405	1,384	24,110	1,781	10,183	457,621	61,400	89,128	23,928	19,737	630
White & green ash	186,757	-	262	244	233	139	-	459	-	18,921	47,073	95,757	20,728	2,213	578	150
Cottonwood	52,385	-	215	-	-	-	97	-	-	5,902	39,090	4,905	1,902	97	-	177
Willow	29,374	-	44	-	-	-	-	-	-	350	25,949	2,283	748	-	-	-
Hackberry	9,885	-	-	-	-	-	-	-	-	3,152	4,171	2,562	-	-	-	-
Balsam poplar	595,247	817	1,693	273	18,443	2,257	2,523	10,643	2,611	3,552	62,364	19,579	219,052	22,864	226,418	2,158
Bigtooth aspen	279,740	3,931	4,885	97	1,406	-	594	701	170	19,538	1,428	18,238	215,032	13,503	217	-
Quaking aspen	3,818,495	40,095	27,161	8,959	99,607	13,572	49,778	16,656	9,709	97,006	75,709	119,309	3,055,639	146,061	58,000	1,234
Paper birch	1,458,718	17,690	24,357	8,639	82,504	7,380	14,943	41,551	5,013	59,620	47,498	124,046	477,387	530,326	17,439	325
Black cherry	15,688	-	-	-	-	-	-	-	-	7,192	895	5,263	1,690	648	-	-
Black walnut	14,163	-	19	-	-	-	-	-	-	9,978	2,610	1,423	39	94	-	-
Butternut	11,150	-	-	-	-	-	-	-	-	7,494	563	1,982	1,016	95	-	-
Other hardwoods	51,687	-	-	-	-	-	64	-	-	7,919	33,122	8,042	2,302	171	67	-
Total hardwoods	10,485,421	68,532	69,234	23,968	220,098	26,056	72,115	97,621	22,016	1,366,280	1,039,906	1,633,435	4,654,735	852,865	333,663	4,897
All species	15,133,058	539,767	527,510	128,316	719,528	97,370	760,814	794,069	408,005	1,410,964	1,184,661	1,744,185	5,370,673	1,050,732	389,951	6,513

Table 49. -- Net volume of sawtimber on timberland by species group and forest type, Minnesota, 1990

(In thousand board feet)[1]

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	1,706,422	1,119,728	81,953	9,056	43,256	9,521	66,179	1,376	4,705	57,596	5,889	12,279	252,723	40,183	1,978	-
Red pine	2,444,196	187,787	1,424,156	65,220	81,183	11,250	25,104	4,753	8,077	51,844	2,820	38,572	436,072	103,191	4,167	-
White pine	1,297,353	30,980	140,918	356,622	114,951	11,874	18,879	24,938	13,478	26,664	12,253	168,603	273,898	99,939	3,356	-
White spruce	1,152,492	31,144	25,479	26,079	202,265	146,039	22,834	25,723	1,373	9,618	93,452	67,253	352,724	105,665	42,458	386
Black spruce	709,531	8,264	3,599	3,066	82,603	7,539	374,189	79,249	32,123	-	15,899	1,765	78,313	16,830	6,014	78
Balsam fir	1,859,325	17,938	28,877	6,291	498,050	17,196	56,007	59,926	14,618	2,780	131,652	81,121	697,384	180,462	67,023	-
Tamarack	835,291	2,315	1,948	-	29,436	540	120,891	68,821	483,441	-	53,128	1,641	43,743	10,449	14,948	3,990
Eastern redcedar	29,531	-	-	-	-	-	-	-	-	20,365	437	7,836	-	893	-	-
Northern white-cedar	2,193,168	-	1,822	1,860	165,710	12,110	34,578	1,533,678	33,238	-	142,219	70,537	96,239	66,203	34,873	101
Other softwoods	8,140	3,257	-	-	-	-	-	-	-	4,012	-	-	871	-	-	-
Total softwoods	12,235,449	1,401,413	1,708,752	468,194	1,217,454	216,069	718,661	1,798,464	591,053	172,879	457,749	449,607	2,231,967	623,815	174,817	4,555
Hardwoods																
Select white oak	1,823,231	1,783	6,155	1,923	2,479	407	-	384	-	1,181,509	80,839	313,511	216,034	15,888	1,617	702
Select red oak	2,638,204	5,522	3,316	1,940	892	-	895	-	2,181	1,803,030	12,166	380,217	347,168	74,816	6,061	-
Other red oak	123,676	-	847	-	-	-	-	-	-	95,898	332	12,593	7,839	4,705	1,462	-
Select hickory	39,396	-	-	-	-	-	-	-	-	32,626	-	2,836	706	3,228	-	-
Other hickory	10,979	-	-	-	-	-	-	-	-	5,276	-	5,340	-	363	-	-
Basswood	1,822,679	-	-	328	3,302	-	-	795	275	178,982	131,685	1,305,373	164,370	35,491	2,078	-
Yellow birch	72,782	-	-	-	1,078	1,202	275	9,245	-	-	16,399	41,330	1,656	1,597	-	-
Hard maple	804,576	-	-	444	826	295	-	279	-	33,687	31,460	684,545	40,747	10,528	1,765	-
Soft maple	503,438	-	-	4,545	3,432	558	3,369	467	1,270	18,250	275,714	122,566	59,704	12,698	865	-
Elm	638,862	-	136	985	2,239	-	510	-	732	87,963	160,946	270,847	87,966	19,004	7,534	-
Black ash	968,817	-	-	369	6,574	324	-	24,127	1,228	13,411	673,359	103,840	89,334	30,026	25,811	414
White & green ash	485,137	-	1,027	822	-	-	-	1,390	-	46,488	132,757	271,574	25,565	3,937	866	711
Cottonwood	235,374	-	1,046	-	-	-	-	-	-	26,963	175,140	23,510	8,308	407	-	-
Willow	95,126	-	-	-	-	-	-	-	-	-	85,095	7,068	2,963	-	-	-
Hackberry	23,940	-	-	-	-	-	-	-	-	5,196	10,996	7,748	-	-	-	-
Balsam poplar	1,157,379	-	3,378	327	36,503	5,512	3,171	29,631	2,542	5,544	154,006	45,443	372,015	55,718	441,498	2,091
Bigtooth aspen	752,257	4,475	12,766	447	3,292	-	-	550	852	59,199	5,361	57,839	560,763	46,713	-	-
Quaking aspen	8,652,491	61,824	52,375	24,696	217,191	31,303	84,083	46,884	28,824	220,713	209,524	348,965	6,804,275	390,834	130,573	427
Paper birch	1,626,662	16,912	15,674	7,820	98,557	11,858	8,903	58,592	5,654	65,177	72,562	230,634	466,983	539,861	27,011	464
Black cherry	26,808	-	-	-	-	-	-	-	-	12,555	2,343	11,510	400	-	-	-
Black walnut	46,779	-	-	-	-	-	-	-	-	35,140	5,583	5,421	196	439	-	-
Butternut	33,340	-	-	-	-	-	-	-	-	23,839	1,634	5,686	1,715	466	-	-
Other hardwoods	89,096	-	-	-	-	-	-	-	-	14,195	63,546	11,355	-	-	-	-
Total hardwoods	22,671,029	90,516	96,720	44,646	376,365	51,459	101,206	172,344	43,558	3,965,641	2,301,447	4,269,751	9,258,707	1,246,719	647,141	4,809
All species	34,906,478	1,491,929	1,805,472	512,840	1,593,819	267,528	819,867	1,970,808	634,611	4,138,520	2,759,196	4,719,358	11,490,674	1,870,534	821,958	9,364

[1] International 1/4-inch rule.

Table 50. -- Net volume of growing stock on timberland by species group and ownership class, Minnesota, 1990

(In thousand cubic feet)

Species group	Total	Ownership class								
		National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Softwoods										
Jack pine	553,019	109,338	4,021	4,242	94,190	93,143	9,995	46,316	180,660	11,114
Red pine	585,215	198,462	1,768	8,692	93,149	86,723	21,198	29,672	134,014	11,537
White pine	263,829	79,505	-	5,101	24,652	36,813	15,592	10,707	77,612	13,847
White spruce	296,414	76,713	1,069	1,953	53,757	55,666	8,011	22,200	67,043	10,002
Black spruce	746,180	179,486	2,331	5,432	282,860	104,080	22,085	39,950	82,746	27,210
Balsam fir	963,830	179,149	386	4,236	181,128	239,176	25,612	75,361	206,125	52,657
Tamarack	475,656	37,742	627	5,080	205,657	67,715	29,774	8,347	109,367	11,347
Eastern redcedar	14,959	-	-	-	964	275	-	-	13,720	-
Northern white-cedar	744,792	117,912	2,803	7,315	285,479	109,264	69,943	69,081	63,614	19,381
Other softwoods	3,743	-	-	-	8	-	-	-	2,974	761
Total softwoods	4,647,637	978,307	13,005	42,051	1,221,844	792,855	202,210	301,634	937,875	157,856
Hardwoods										
Select white oak	647,392	11,649	88	12,311	43,958	36,290	14,796	2,788	507,071	18,441
Select red oak	818,970	14,367	-	23,598	97,481	93,737	9,274	3,884	546,117	30,512
Other red oak	36,749	572	-	1,904	2,731	3,419	64	-	26,877	1,182
Select hickory	16,348	-	-	-	716	-	87	-	15,163	382
Other hickory	9,822	-	-	407	516	85	-	-	8,585	229
Basswood	692,132	48,891	-	13,273	66,313	113,574	23,845	18,520	385,578	22,138
Yellow birch	21,876	7,049	-	-	1,578	6,732	-	666	4,625	1,226
Hard maple	403,671	53,060	199	5,764	53,273	91,043	10,165	13,594	162,437	14,136
Soft maple	345,140	37,713	-	26,812	46,729	68,563	5,183	13,155	127,542	19,443
Elm	269,571	3,395	396	9,175	25,433	31,057	10,393	2,585	178,300	8,837
Black ash	700,461	35,197	1,299	5,767	117,407	155,858	23,474	38,820	298,461	24,178
White & green ash	186,757	4,518	468	8,135	17,875	11,808	3,892	2,337	129,755	7,969
Cottonwood	52,385	97	-	7,522	4,671	1,479	-	-	36,296	2,320
Willow	29,374	-	-	1,761	268	299	-	86	26,794	166
Hackberry	9,885	-	-	290	260	-	-	-	8,942	393
Balsam poplar	595,247	48,450	1,163	5,387	131,907	126,363	30,026	36,241	199,038	16,672
Bigtooth aspen	279,740	35,217	114	1,089	37,923	54,227	5,831	6,324	128,768	10,247
Quaking aspen	3,818,495	549,851	4,828	38,746	634,066	802,929	155,982	164,768	1,305,167	162,158
Paper birch	1,458,718	273,112	325	12,894	200,234	340,428	46,187	64,754	433,407	87,377
Black cherry	15,688	-	-	148	716	751	-	-	13,432	641
Black walnut	14,163	-	-	-	1,420	39	-	-	11,706	998
Butternut	11,150	-	-	195	1,071	-	-	169	9,259	456
Other hardwoods	51,687	-	-	1,168	5,677	1,496	-	261	41,759	1,326
Total hardwoods	10,485,421	1,123,138	8,880	176,346	1,492,223	1,940,177	339,199	368,952	4,605,079	431,427
All species	15,133,058	2,101,445	21,885	218,397	2,714,067	2,733,032	541,409	670,586	5,542,954	589,283

Table 51. -- Net volume of sawtimber on timberland by species group and ownership class, Minnesota, 1990

(In thousand board feet)[1]

Species group	Total	Ownership class								
		National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Softwoods										
Jack pine	1,706,422	352,544	14,680	17,897	309,285	294,659	23,787	99,957	552,550	41,063
Red pine	2,444,196	861,948	5,976	38,852	364,560	396,197	107,914	114,970	500,638	53,141
White pine	1,297,353	405,804	-	24,140	117,920	181,295	68,114	52,965	380,359	66,756
White spruce	1,152,492	274,357	4,409	8,756	199,035	225,885	33,381	82,461	278,589	45,619
Black spruce	709,531	194,271	1,459	4,335	251,623	89,859	12,394	46,832	78,093	30,665
Balsam fir	1,859,325	295,208	820	12,204	317,641	488,358	47,734	129,918	471,259	96,183
Tamarack	835,291	71,986	1,574	11,432	296,590	105,169	56,704	15,044	252,137	24,655
Eastern redcedar	29,531	-	-	-	-	-	-	-	29,531	-
Northern white-cedar	2,193,168	443,020	3,924	12,461	731,048	348,216	162,012	235,229	183,499	73,759
Other softwoods	8,140	-	-	-	-	-	-	-	8,140	-
Total softwoods	12,235,449	2,899,138	32,842	130,077	2,587,702	2,129,638	512,040	777,376	2,734,795	431,841
Hardwoods										
Select white oak	1,823,231	17,039	214	33,006	111,493	71,248	25,23	2,889	1,514,767	47,340
Select red oak	2,638,204	24,940	-	67,457	311,452	252,743	24,719	5,391	1,856,927	94,575
Other red oak	123,676	2,106	-	2,650	9,437	5,072	298	-	98,892	5,221
Select hickory	39,396	-	-	-	1,972	-	319	-	36,761	344
Other hickory	10,979	-	-	812	434	363	-	-	8,906	464
Basswood	1,822,679	119,740	-	30,449	171,502	242,391	60,575	48,216	1,090,244	59,562
Yellow birch	72,782	25,467	-	-	5,579	22,315	-	1,866	12,754	4,801
Hard maple	804,576	127,346	-	10,549	104,782	153,826	17,759	23,475	347,286	19,553
Soft maple	503,438	22,863	-	109,667	51,862	65,154	1,341	11,279	206,496	34,776
Elm	638,862	6,603	1,097	20,664	62,342	61,888	18,727	6,103	440,040	21,398
Black ash	968,817	47,875	2,168	11,247	135,991	206,540	27,629	63,908	451,640	21,819
White & green ash	485,137	7,556	664	27,581	45,725	26,275	8,134	5,005	341,154	23,043
Cottonwood	235,374	-	-	29,940	22,454	5,215	-	-	167,202	10,563
Willow	95,126	-	-	5,898	857	658	-	343	86,770	600
Hackberry	23,940	-	-	-	-	-	-	-	23,046	894
Balsam poplar	1,157,379	118,997	623	9,454	235,085	289,570	35,679	79,899	358,627	29,445
Bigtooth aspen	752,257	84,491	517	3,441	95,943	148,240	13,660	18,434	359,229	28,302
Quaking aspen	8,652,491	1,423,068	17,864	96,122	1,297,424	1,958,961	378,520	349,849	2,749,313	381,370
Paper birch	1,626,662	317,201	1,031	19,761	219,973	333,513	66,904	78,970	507,416	81,893
Black cherry	26,808	-	-	-	-	239	-	-	25,061	1,508
Black walnut	46,779	-	-	-	5,269	189	-	-	37,519	3,802
Butternut	33,340	-	-	988	2,416	-	-	837	27,122	1,977
Other hardwoods	89,096	-	-	2,063	8,206	784	-	-	74,278	3,765
Total hardwoods	22,671,029	2,345,292	24,178	481,749	2,900,198	3,845,184	679,499	696,464	10,821,450	877,015
All species	34,906,478	5,244,430	57,020	611,826	5,487,900	5,974,822	1,191,539	1,473,840	13,556,245	1,308,856

[1] International 1/4-inch rule.

Table 52. -- Net volume of growing stock on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand cubic feet)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Aspen-Birch Unit									
Jack pine	159,206	2,936	17,291	57,533	54,714	16,663	8,571	1,498	-
Red pine	195,175	8,511	32,916	55,827	60,196	24,556	8,106	4,337	726
White pine	65,329	2,366	362	1,014	21,471	12,941	24,556	2,619	-
Balsam fir	516,553	32,622	81,745	217,288	136,965	38,550	8,972	411	-
White spruce	68,357	2,914	14,668	27,774	14,614	7,530	-	857	-
Black spruce	563,826	11,634	80,690	162,813	169,162	91,221	30,834	5,682	11,790
Northern white-cedar	507,296	3,206	17,038	31,523	95,207	114,496	97,373	72,942	75,511
Tamarack	137,220	8,222	20,332	32,534	30,133	20,873	6,179	11,870	7,077
Oak-hickory	8,018	1,399	-	1,518	2,141	2,960	-	-	-
Elm-ash-soft maple	349,615	24,703	23,515	66,330	95,888	85,769	30,005	10,889	12,516
Maple-basswood	292,977	15,591	25,443	80,832	72,285	64,210	20,521	11,498	2,597
Aspen	2,006,786	138,862	338,105	808,618	599,991	99,087	19,312	-	2,811
Paper birch	560,364	13,597	33,481	221,076	233,383	41,473	8,696	8,658	-
Balsam poplar	178,379	13,183	11,594	88,879	51,058	9,492	2,574	1,599	-
Nonstocked	2,798	2,331	-	131	336	-	-	-	-
All types	5,611,899	282,077	697,180	1,853,690	1,637,544	629,821	265,699	132,860	113,028
Northern Pine Unit									
Jack pine	363,546	7,586	58,994	187,575	94,848	14,543	-	-	-
Red pine	293,039	21,720	56,626	72,488	65,150	41,407	29,178	6,470	-
White pine	50,941	1,098	2,764	11,515	24,910	3,551	4,300	2,803	-
Balsam fir	195,907	6,552	24,002	86,331	66,687	12,335	-	-	-
White spruce	28,945	2,281	7,208	3,207	12,411	3,838	-	-	-
Black spruce	179,935	6,578	27,553	56,938	42,200	33,006	7,513	3,505	2,642
Northern white-cedar	286,773	1,089	12,339	23,717	55,047	76,975	51,449	30,285	35,872
Tamarack	241,373	8,638	32,346	41,853	58,218	54,071	16,051	22,203	7,993
Oak-hickory	366,885	6,581	14,472	155,681	115,952	56,896	10,621	6,682	-
Elm-ash-soft maple	486,726	27,929	28,034	95,947	189,223	72,098	43,819	16,064	13,612
Maple-basswood	793,034	16,121	32,452	259,116	294,582	141,693	39,684	7,937	1,449
Aspen	2,714,428	178,653	408,704	1,229,577	778,252	97,268	19,820	2,154	-
Paper birch	434,493	9,930	32,566	191,396	161,961	26,744	3,824	8,072	-
Balsam poplar	185,815	14,721	40,529	76,463	41,576	12,526	-	-	-
Nonstocked	3,019	1,568	316	727	408	-	-	-	-
All types	6,624,859	311,045	778,905	2,492,531	2,001,425	646,951	226,259	106,175	61,568

(Table 52 continued on next page)

(Table 52 continued)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Central Hardwood Unit									
Jack pine	17,015	1,401	5,573	8,823	1,218	-	-	-	-
Red pine	38,084	5,809	23,351	7,694	-	1,230	-	-	-
White pine	10,752	16	-	4,298	-	6,438	-	-	-
Balsam fir	7,068	881	-	5,250	937	-	-	-	-
White spruce	68	-	68	-	-	-	-	-	-
Black spruce	15,353	842	3,269	2,626	8,616	-	-	-	-
Tamarack	28,014	513	7,106	8,905	7,316	2,563	-	1,611	-
Oak-hickory	902,931	9,524	26,621	229,314	310,454	193,830	126,198	4,917	2,073
Elm-ash-soft maple	254,480	14,093	32,552	55,484	99,212	35,214	8,004	9,323	598
Maple-basswood	478,771	34,880	27,641	123,879	158,426	91,897	37,661	2,216	2,171
Aspen	510,570	31,105	94,191	273,482	92,980	18,812	-	-	-
Paper birch	55,875	1,289	6,214	30,392	14,494	2,923	563	-	-
Balsam poplar	11,427	74	1,836	9,517	-	-	-	-	-
Nonstocked	519	80	-	113	326	-	-	-	-
All types	2,330,927	100,507	228,422	759,777	693,979	352,907	172,426	18,067	4,842
Prairie Unit									
Red pine	1,212	-	-	1,212	-	-	-	-	-
White pine	1,294	-	-	-	1,294	-	-	-	-
Black spruce	1,700	-	528	1,172	-	-	-	-	-
Tamarack	1,398	-	1,398	-	-	-	-	-	-
Oak-hickory	133,130	1,114	1,689	17,294	41,472	42,375	23,449	5,737	-
Elm-ash-soft maple	93,840	3,056	11,725	40,877	27,945	2,430	7,807	-	-
Maple-basswood	179,403	8,574	6,110	23,145	89,033	29,961	21,985	595	-
Aspen	138,889	19,386	36,714	62,877	19,912	-	-	-	-
Balsam poplar	14,330	687	4,674	8,969	-	-	-	-	-
Nonstocked	177	177	-	-	-	-	-	-	-
All types	565,373	32,994	62,838	155,546	179,656	74,766	53,241	6,332	-

(Table 51 continued on next page)

(Table 52 continued)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
All Units									
Jack pine	539,767	11,923	81,858	253,931	150,780	31,206	8,571	1,498	-
Red pine	527,510	36,040	112,893	137,221	125,346	67,193	37,284	10,807	726
White pine	128,316	3,480	3,126	16,827	47,675	22,930	28,856	5,422	-
Balsam fir	719,528	40,055	105,747	308,869	204,589	50,885	8,972	411	-
White spruce	97,370	5,195	21,944	30,981	27,025	11,368	-	857	-
Black spruce	760,814	19,054	112,040	223,549	219,978	124,227	38,347	9,187	14,432
Northern white-cedar	794,069	4,295	29,377	55,240	150,254	191,471	148,822	103,227	111,383
Tamarack	408,005	17,373	61,182	83,292	95,667	77,507	22,230	35,684	15,070
Oak-hickory	1,410,964	18,618	42,782	403,807	470,019	296,061	160,268	17,336	2,073
Elm-ash-soft maple	1,184,661	69,781	95,826	258,638	412,268	195,511	89,635	36,276	26,726
Maple-basswood	1,744,185	75,166	91,646	486,972	614,326	327,761	119,851	22,246	6,217
Aspen	5,370,673	368,006	877,714	2,374,554	1,491,135	215,167	39,132	2,154	2,811
Paper birch	1,050,732	24,816	72,261	442,864	409,838	71,140	13,083	16,730	-
Balsam poplar	389,951	28,665	58,633	183,828	92,634	22,018	2,574	1,599	-
Nonstocked	6,513	4,156	316	971	1,070	-	-	-	-
All types	15,133,058	726,623	1,767,345	5,261,544	4,512,604	1,704,445	717,625	263,434	179,438

Table 53. -- Net volume of sawtimber on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand board feet)[1]

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Aspen-Birch Unit									
Jack pine	472,483	4,739	23,572	160,267	188,279	62,080	29,157	4,389	-
Red pine	686,970	20,947	60,590	191,269	248,280	108,170	35,703	19,276	2,735
White pine	277,812	11,863	641	3,433	79,352	56,260	112,739	13,524	-
Balsam fir	1,126,249	68,133	140,298	406,098	352,116	129,812	28,571	1,221	-
White spruce	184,598	6,986	27,389	67,960	43,073	34,465	-	4,725	-
Black spruce	609,166	11,022	62,718	165,584	198,848	119,922	41,221	4,390	5,461
Northern white-cedar	1,335,747	6,963	28,010	54,440	175,433	255,232	306,017	250,756	258,896
Tamarack	231,159	11,669	20,792	44,107	54,519	46,003	8,298	32,284	13,487
Oak-hickory	25,722	4,546	-	2,946	10,142	8,088	-	-	-
Elm-ash-soft maple	683,211	45,169	35,878	94,545	160,447	194,578	79,244	30,242	43,108
Maple-basswood	694,597	31,303	46,256	128,577	170,320	210,382	57,013	40,879	9,867
Aspen	4,206,028	221,752	456,844	1,501,034	1,629,652	327,232	61,746	-	7,768
Paper birch	938,853	29,390	48,437	309,938	378,960	116,719	27,729	27,680	-
Balsam poplar	411,169	15,936	17,800	187,242	136,650	39,016	8,963	5,562	-
Nonstocked	6,134	3,973	-	672	1,489	-	-	-	-
All types	11,889,898	494,391	969,225	3,318,112	3,827,560	1,707,959	796,401	434,928	341,322
Northern Pine Unit									
Jack pine	976,546	10,871	100,463	507,808	292,763	64,641	-	-	-
Red pine	1,051,978	28,550	97,772	279,275	286,903	191,726	138,559	29,193	-
White pine	183,415	1,065	6,376	36,581	92,945	12,040	22,448	11,960	-
Balsam fir	447,324	16,976	37,081	190,786	161,763	40,718	-	-	-
White spruce	82,859	3,831	12,424	8,242	42,299	16,063	-	-	-
Black spruce	192,934	6,993	24,030	68,694	51,652	32,539	4,237	4,789	-
Northern white-cedar	635,061	1,982	25,930	43,261	97,434	160,863	129,138	63,703	112,750
Tamarack	348,633	10,286	36,970	48,844	93,828	89,519	26,930	33,498	8,758
Oak-hickory	853,339	9,517	24,110	292,213	275,503	188,673	36,907	26,416	-
Elm-ash-soft maple	1,077,925	59,510	41,541	157,141	425,700	182,035	122,068	46,117	43,813
Maple-basswood	1,951,993	32,901	53,116	464,767	795,143	445,071	128,555	27,535	4,905
Aspen	6,159,583	341,099	559,427	2,611,901	2,254,986	311,626	72,089	8,455	-
Paper birch	838,576	18,817	45,866	312,060	344,080	77,313	12,196	28,244	-
Balsam poplar	377,399	17,590	44,208	148,490	127,667	39,444	-	-	-
Nonstocked	3,230	2,232	396	-	602	-	-	-	-
All types	15,180,795	562,220	1,109,710	5,170,063	5,343,268	1,852,271	693,127	279,910	170,226

(Table 53 continued on next page)

(Table 53 continued)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Central Hardwood Unit									
Jack pine	42,900	3,083	6,739	28,228	4,850	-	-	-	-
Red pine	61,144	12,239	25,584	18,946	-	4,375	-	-	-
White pine	45,499	-	-	12,072	-	33,427	-	-	-
Balsam fir	20,246	2,144	-	15,343	2,759	-	-	-	-
White spruce	71	-	71	-	-	-	-	-	-
Black spruce	16,547	435	2,403	4,557	9,152	-	-	-	-
Tamarack	54,819	-	9,893	14,212	18,683	9,814	-	2,217	-
Oak-hickory	2,793,338	21,429	44,187	543,296	970,540	686,243	498,910	20,956	7,777
Elm-ash-soft maple	704,762	34,393	57,419	149,044	274,479	124,609	20,621	42,681	1,516
Maple-basswood	1,409,499	82,330	51,313	302,761	477,940	334,343	142,925	9,436	8,451
Aspen	951,656	41,689	103,122	482,336	257,068	67,441	-	-	-
Paper birch	93,105	1,793	5,921	48,454	25,706	9,621	1,610	-	-
Balsam poplar	23,473	-	-	23,473	-	-	-	-	-
All types	6,217,059	199,535	306,652	1,642,722	2,041,177	1,269,873	664,066	75,290	17,744
Prairie Unit									
Red pine	5,380	-	-	5,380	-	-	-	-	-
White pine	6,114	-	-	-	6,114	-	-	-	-
Black spruce	1,220	-	-	1,220	-	-	-	-	-
Oak-hickory	466,121	1,710	1,972	49,353	128,062	155,908	101,470	27,646	-
Elm-ash-soft maple	293,298	11,480	27,260	116,537	98,178	12,002	27,841	-	-
Maple-basswood	663,269	22,654	16,636	68,439	335,541	121,886	95,635	2,478	-
Aspen	173,407	15,527	26,331	96,060	35,489	-	-	-	-
Balsam poplar	9,917	762	2,409	6,746	-	-	-	-	-
All types	1,618,726	52,133	74,608	343,735	603,384	289,796	224,946	30,124	-

(Table 53 continued on next page)

(Table 53 continued)

Forest Survey Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
All Units									
Jack pine	1,491,929	18,693	130,774	696,303	485,892	126,721	29,157	4,389	-
Red pine	1,805,472	61,736	183,946	494,870	535,183	304,271	174,262	48,469	2,735
White pine	512,840	12,928	7,017	52,086	178,411	101,727	135,187	25,484	-
Balsam fir	1,593,819	87,253	177,379	612,227	516,638	170,530	28,571	1,221	-
White spruce	267,528	10,817	39,884	76,202	85,372	50,528	-	4,725	-
Black spruce	819,867	18,450	89,151	240,055	259,652	152,461	45,458	9,179	5,461
Northern white-cedar	1,970,808	8,945	53,940	97,701	272,867	416,095	435,155	314,459	371,646
Tamarack	634,611	21,955	67,655	107,163	167,030	145,336	35,228	67,999	22,245
Oak-hickory	4,138,520	37,202	70,269	887,808	1,384,247	1,038,912	637,287	75,018	7,777
Elm-ash-soft maple	2,759,196	150,552	162,098	517,267	958,804	513,224	249,774	119,040	88,437
Maple-basswood	4,719,358	169,188	167,321	964,544	1,778,944	1,111,682	424,128	80,328	23,223
Aspen	11,490,674	620,067	1,145,724	4,691,331	4,177,195	706,299	133,835	8,455	7,768
Paper birch	1,870,534	50,000	100,224	670,452	748,746	203,653	41,535	55,924	-
Balsam poplar	821,958	34,288	64,417	365,951	264,317	78,460	8,963	5,562	-
Nonstocked	9,364	6,205	396	672	2,091	-	-	-	-
All types	34,906,478	1,308,279	2,460,195	10,474,632	11,815,389	5,119,899	2,378,540	820,252	529,292

[1] International 1/4-inch rule.

Table 54. -- Net volume of growing stock on timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand cubic feet)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	321,130	-	-	4,348	1,776	4,201	18,689	13,587	22,377	34,428	44,893	73,319	78,951	24,561	-
Poletimber	202,989	-	-	705	-	2,026	3,789	4,777	22,032	14,911	36,661	44,091	52,498	19,123	2,376
Sapling-seedling	15,648	804	1,149	2,633	1,221	1,352	1,975	3,137	2,372	1,005	-	-	-	-	-
Total	539,767	804	1,149	7,686	2,997	7,579	24,453	21,501	46,781	50,344	81,554	117,410	131,449	43,684	2,376
Red pine															
Sawtimber	385,117	-	264	-	2,539	-	8,969	15,479	15,508	20,709	16,865	59,442	127,170	85,698	32,474
Poletimber	123,938	-	-	247	-	2,772	6,932	2,364	5,122	5,371	4,263	26,374	34,535	15,129	20,829
Sapling-seedling	18,455	505	2,549	869	3,697	2,603	4,111	-	930	1,742	811	638	-	-	-
Total	527,510	505	2,813	1,116	6,236	5,375	20,012	17,843	21,560	27,822	21,939	86,454	161,705	100,827	53,303
White pine															
Sawtimber	114,513	-	-	-	-	857	2,960	1,294	3,563	3,080	14,670	25,056	39,521	15,302	8,210
Poletimber	11,421	-	-	-	-	-	-	1,034	2,642	-	-	5,428	-	2,317	-
Sapling-seedling	2,382	-	16	-	-	-	2,366	-	-	-	-	-	-	-	-
Total	128,316	-	16	-	-	857	5,326	2,328	6,205	3,080	14,670	30,484	39,521	17,619	8,210
Balsam fir															
Sawtimber	269,714	-	129	297	2,477	5,517	10,531	14,072	17,375	33,955	18,100	68,676	75,704	22,881	-
Poletimber	365,101	-	273	4,325	2,902	11,834	22,716	13,203	25,738	34,563	29,958	80,472	96,852	31,689	10,576
Sapling-seedling	84,713	503	2,599	8,696	8,550	12,799	15,422	8,204	8,032	5,249	2,125	7,552	4,982	-	-
Total	719,528	503	3,001	13,318	13,929	30,150	48,669	35,479	51,145	73,767	50,183	156,700	177,538	54,570	10,576
White spruce															
Sawtimber	48,865	-	285	378	607	1,363	5,885	-	5,250	3,727	2,048	11,379	7,796	10,147	-
Poletimber	40,119	-	165	497	-	1,366	4,716	-	4,142	-	1,460	11,570	9,618	6,585	-
Sapling-seedling	8,386	217	1,035	402	555	1,624	1,248	-	3,305	-	-	-	-	-	-
Total	97,370	217	1,485	1,277	1,162	4,353	11,849	-	12,697	3,727	3,508	22,949	17,414	16,732	-
Black spruce															
Sawtimber	77,338	-	1,096	-	2,038	5,003	7,455	5,036	10,303	8,712	8,009	18,283	7,273	4,130	-
Poletimber	474,784	-	524	439	5,999	17,082	30,423	35,378	42,219	70,029	45,238	105,338	84,410	28,450	9,255
Sapling-seedling	208,692	906	5,532	11,336	13,503	25,462	21,904	18,339	22,987	24,874	19,842	29,174	13,453	1,380	-
Total	760,814	906	7,152	11,775	21,540	47,547	59,782	58,753	75,509	103,615	73,089	152,795	105,136	33,960	9,255
Northern white-cedar															
Sawtimber	430,750	-	139	-	1,205	7,095	7,992	6,116	17,478	21,585	17,673	53,923	123,872	111,807	61,865
Poletimber	321,077	-	439	736	1,340	1,007	3,632	3,393	10,802	11,933	21,541	45,851	90,373	58,180	71,850
Sapling-seedling	42,242	131	910	987	1,732	3,544	4,332	3,178	7,598	2,706	1,151	12,502	3,471	-	-
Total	794,069	131	1,488	1,723	4,277	11,646	15,956	12,687	35,878	36,224	40,365	112,276	217,716	169,987	133,715
Tamarack															
Sawtimber	97,697	-	1,690	4,949	6,620	11,173	15,382	13,575	6,575	6,497	11,875	9,866	2,117	7,378	-
Poletimber	228,979	-	1,851	3,329	5,236	19,384	21,469	26,338	36,287	35,799	28,089	36,932	11,349	2,916	-
Sapling-seedling	81,329	2,102	3,721	6,464	9,294	14,340	12,979	7,446	10,047	5,737	3,891	2,989	2,319	-	-
Total	408,005	2,102	7,262	14,742	21,150	44,897	49,830	47,359	52,909	48,033	43,855	49,787	15,785	10,294	-

(Table 54 continued on next page)

(Table 54 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Oak-hickory															
Sawtimber	1,045,604	105	186	836	2,687	16,879	30,861	38,392	76,186	105,922	122,761	282,090	302,841	61,957	3,901
Poletimber	341,231	-	135	1,464	1,336	7,473	25,157	15,850	17,961	42,981	34,238	92,893	91,624	10,119	-
Sapling-seedling	24,129	208	570	2,811	2,662	5,626	5,692	2,978	2,039	1,543	-	-	-	-	-
Total	1,410,964	313	891	5,111	6,685	29,978	61,710	57,220	96,186	150,446	156,999	374,983	394,465	72,076	3,901
Elm-ash-soft maple															
Sawtimber	516,672	-	795	3,514	8,386	14,841	23,454	28,368	48,274	60,091	32,739	107,120	127,100	49,024	12,966
Poletimber	548,863	75	814	3,996	6,717	25,211	20,281	28,308	72,196	63,100	47,753	151,982	93,300	25,132	9,998
Sapling-seedling	119,126	613	7,811	19,754	12,532	27,192	24,637	9,963	7,341	3,246	2,605	3,432	-	-	-
Total	1,184,661	688	9,420	27,264	27,635	67,244	68,372	66,639	127,811	126,437	83,097	262,534	220,400	74,156	22,964
Maple-basswood															
Sawtimber	1,135,071	8,760	241	2,502	2,118	8,276	34,049	26,216	58,057	90,457	105,469	273,952	379,462	134,272	11,240
Poletimber	508,799	-	511	1,096	209	4,842	15,870	12,929	41,199	43,521	50,780	126,311	160,008	46,967	4,556
Sapling-seedling	100,315	456	1,874	8,392	7,230	15,186	20,838	15,861	15,040	9,633	2,977	-	2,828	-	-
Total	1,744,185	9,216	2,626	11,990	9,557	28,304	70,757	55,006	114,296	143,611	159,226	400,263	542,298	181,239	15,796
Aspen															
Sawtimber	2,451,989	-	2,314	7,756	17,060	58,864	81,051	110,913	160,780	249,064	185,156	638,922	601,278	274,910	63,921
Poletimber	2,429,886	-	5,185	7,714	17,422	50,171	123,591	108,123	234,018	286,174	234,383	612,161	492,434	235,422	23,088
Sapling-seedling	488,798	6,210	21,426	53,327	50,177	84,203	80,447	64,000	56,455	32,845	18,934	17,110	2,502	1,162	-
Total	5,370,673	6,210	28,925	68,797	84,659	193,238	285,089	283,036	451,253	568,083	438,473	1,268,193	1,096,214	511,494	87,009
Paper birch															
Sawtimber	288,314	2,331	1,026	563	2,033	7,775	14,258	21,504	32,121	31,601	27,244	64,529	66,165	17,164	-
Poletimber	711,028	-	172	1,883	5,341	9,396	29,915	29,293	60,977	61,356	51,769	163,486	218,428	57,900	21,112
Sapling-seedling	51,390	313	1,766	6,364	3,701	7,000	10,784	4,627	7,820	2,859	2,290	1,609	2,257	-	-
Total	1,050,732	2,644	2,964	8,810	11,075	24,171	54,957	55,424	100,918	95,816	81,303	229,624	286,850	75,064	21,112
Balsam poplar															
Sawtimber	182,098	-	686	1,912	683	7,605	4,865	15,457	11,604	15,604	13,746	41,531	31,663	7,133	29,609
Poletimber	160,676	-	288	3,784	6,541	14,868	9,843	10,898	13,485	26,316	10,031	36,857	16,133	11,632	-
Sapling-seedling	47,177	1,338	2,097	6,531	4,401	7,582	9,436	5,846	1,534	1,997	4,341	2,074	-	-	-
Total	389,951	1,338	3,071	12,227	11,625	30,055	24,144	32,201	26,623	43,917	28,118	80,462	47,796	18,765	29,609
Nonstocked	6,513	2,538	2,812	1,163	-	-	-	-	-	-	-	-	-	-	-
All types															
Sawtimber	7,364,872	11,196	8,851	27,055	50,229	149,449	266,401	310,009	485,451	685,432	621,248	1,728,088	1,970,913	826,364	224,186
Poletimber	6,468,891	75	10,357	30,215	53,043	167,432	318,334	291,888	588,820	696,054	596,164	1,539,746	1,451,562	551,561	173,640
Sapling-seedling	1,292,782	14,306	53,055	128,566	119,255	208,513	216,171	143,579	145,500	93,436	58,967	77,080	31,812	2,542	-
Nonstocked	6,513	2,538	2,812	1,163	-	-	-	-	-	-	-	-	-	-	-
Total	15,133,058	28,115	75,075	186,999	222,527	525,394	800,906	745,476	1,219,771	1,474,922	1,276,379	3,344,914	3,454,287	1,380,467	397,826

Table 55. -- Net volume of sawtimber on timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand board feet)[1]

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	1,147,762	-	-	20,156	7,774	15,919	71,133	49,660	77,884	119,923	165,651	267,526	274,088	78,048	-
Poletimber	316,800	-	-	309	-	4,149	6,101	9,081	30,156	24,775	61,073	72,208	80,929	22,602	5,417
Sapling-seedling	27,367	2,437	2,228	6,595	1,378	3,319	2,271	5,073	3,496	570	-	-	-	-	-
Total	1,491,929	2,437	2,228	27,060	9,152	23,387	79,505	63,814	111,536	145,268	226,724	339,734	355,017	100,650	5,417
Red pine															
Sawtimber	1,611,012	-	1,441	-	12,536	-	40,166	68,264	67,442	94,697	68,559	247,622	534,713	345,174	130,398
Poletimber	150,320	-	-	325	-	1,609	9,056	5,994	6,874	7,563	7,872	31,335	47,339	15,167	17,186
Sapling-seedling	44,140	1,202	8,809	1,773	12,071	4,551	9,381	-	1,760	591	3,275	727	-	-	-
Total	1,805,472	1,202	10,250	2,098	24,607	6,160	58,603	74,258	76,076	102,851	79,706	279,684	582,052	360,341	147,584
White pine															
Sawtimber	474,585	-	-	-	-	3,238	13,672	6,114	13,290	12,657	65,177	111,062	165,605	56,306	27,464
Poletimber	26,392	-	-	-	-	-	-	2,236	4,690	-	-	14,365	-	5,101	-
Sapling-seedling	11,863	-	-	-	-	-	11,863	-	-	-	-	-	-	-	-
Total	512,840	-	-	-	-	3,238	25,535	8,350	17,980	12,657	65,177	125,427	165,605	61,407	27,464
Balsam fir															
Sawtimber	874,709	-	675	1,204	8,466	22,425	38,767	47,500	57,729	108,067	64,337	225,424	234,924	65,191	-
Poletimber	559,119	-	298	7,953	4,105	19,757	33,250	21,366	39,166	63,018	44,670	113,096	139,357	55,997	17,086
Sapling-seedling	159,991	1,713	8,366	15,156	21,380	21,243	25,924	15,836	16,291	9,947	2,550	15,013	6,572	-	-
Total	1,593,819	1,713	9,339	24,313	33,951	63,425	97,941	84,702	113,186	181,032	111,557	353,533	380,853	121,188	17,086
White spruce															
Sawtimber	177,629	-	875	2,000	2,491	6,219	26,831	-	17,847	10,940	6,986	44,355	26,665	32,420	-
Poletimber	73,376	-	-	-	-	2,382	10,124	-	1,681	-	1,061	24,315	18,538	15,275	-
Sapling-seedling	16,523	777	4,110	338	1,192	4,361	1,281	-	4,464	-	-	-	-	-	-
Total	267,528	777	4,985	2,338	3,683	12,962	38,236	-	23,992	10,940	8,047	68,670	45,203	47,695	-
Black spruce															
Sawtimber	252,445	-	4,359	-	6,275	15,803	28,624	16,705	32,575	26,679	24,833	57,726	27,398	11,468	-
Poletimber	441,897	-	815	-	5,797	23,195	32,390	46,436	39,182	71,691	46,177	95,345	65,993	9,214	5,662
Sapling-seedling	125,525	1,119	5,785	9,426	15,670	17,483	15,637	12,009	12,672	7,621	17,197	8,871	2,035	-	-
Total	819,867	1,119	10,959	9,426	27,742	56,481	76,651	75,150	84,429	105,991	88,207	161,942	95,426	20,682	5,662
Northern white-cedar															
Sawtimber	1,461,700	-	715	-	4,765	25,463	25,648	18,406	61,648	71,122	55,948	185,980	431,111	368,278	212,616
Poletimber	453,649	-	920	1,597	890	2,300	4,540	4,127	12,859	18,093	33,199	69,899	129,133	80,953	95,139
Sapling-seedling	55,459	717	2,166	1,246	4,385	6,802	3,961	2,853	8,300	3,575	2,880	12,902	5,672	-	-
Total	1,970,808	717	3,801	2,843	10,040	34,565	34,149	25,386	82,807	92,790	92,027	268,781	565,916	449,231	307,755
Tamarack															
Sawtimber	340,286	-	6,335	21,565	24,871	43,817	55,995	48,221	22,343	23,303	36,183	31,579	6,394	19,680	-
Poletimber	224,837	-	1,610	3,006	4,492	30,934	19,245	26,901	36,029	30,963	31,706	26,495	9,796	3,660	-
Sapling-seedling	69,488	1,589	5,326	7,369	15,798	14,332	7,428	7,208	7,061	1,353	952	-	1,072	-	-
Total	634,611	1,589	13,271	31,940	45,161	89,083	82,668	82,330	65,433	55,619	68,841	58,074	17,262	23,340	-

(Table 55 continued on next page)

(Table 55 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Oak-hickory															
Sawtimber	3,606,230	285	943	2,739	6,815	60,125	107,472	139,842	254,426	360,703	437,859	961,241	1,062,222	196,418	15,140
Poletimber	479,397	-	360	1,235	1,642	11,224	28,576	17,484	27,802	72,256	52,257	132,524	121,860	12,177	-
Sapling-seedling	52,893	395	1,406	6,180	4,275	13,798	12,521	8,446	3,266	2,606	-	-	-	-	-
Total	4,138,520	680	2,709	10,154	12,732	85,147	148,569	165,772	285,494	435,565	490,116	1,093,765	1,184,082	208,595	15,140
Elm-ash-soft maple															
Sawtimber	1,709,278	-	4,020	13,042	29,853	48,973	84,718	96,790	162,785	180,948	110,367	354,991	419,254	158,403	45,134
Poletimber	812,477	-	793	3,955	5,953	35,343	23,451	41,316	95,805	84,899	80,123	263,892	128,300	36,142	12,505
Sapling-seedling	237,441	677	17,918	47,806	22,335	56,068	42,915	22,222	13,446	5,963	3,979	4,112	-	-	-
Total	2,759,196	677	22,731	64,803	58,141	140,384	151,084	160,328	272,036	271,810	194,469	622,995	547,554	194,545	57,639
Maple-basswood															
Sawtimber	3,731,567	32,113	576	8,615	8,473	31,862	114,675	91,691	213,081	314,216	377,123	898,313	1,209,329	398,497	33,003
Poletimber	758,079	-	1,181	2,194	-	7,077	22,208	17,251	62,063	59,572	72,241	203,954	239,976	66,851	3,511
Sapling-seedling	229,712	1,138	3,594	26,937	16,363	38,717	51,200	21,743	39,107	19,056	6,529	-	5,328	-	-
Total	4,719,358	33,251	5,351	37,746	24,836	77,656	188,083	130,685	314,251	392,844	455,893	1,102,267	1,454,633	465,348	36,514
Aspen															
Sawtimber	7,548,069	-	8,154	25,473	61,039	195,060	259,619	355,468	516,433	758,531	579,894	1,981,280	1,786,074	837,131	183,913
Poletimber	3,160,073	-	4,479	6,764	16,941	53,944	156,301	149,595	285,472	381,522	340,084	829,765	617,624	286,333	31,249
Sapling-seedling	782,532	10,486	34,135	104,861	76,510	142,934	131,582	98,331	72,247	53,082	30,679	27,248	-	437	-
Total	11,490,674	10,486	46,768	137,098	154,490	391,938	547,502	603,394	874,152	1,193,135	950,657	2,838,293	2,403,698	1,123,901	215,162
Paper birch															
Sawtimber	875,869	5,536	4,782	1,610	5,212	28,429	43,270	64,567	104,338	92,754	79,717	195,770	196,773	53,111	-
Poletimber	903,264	-	356	1,729	9,328	12,329	38,175	37,496	77,119	76,138	75,862	227,044	267,822	52,211	27,655
Sapling-seedling	91,401	352	5,042	7,393	10,336	14,278	21,714	7,816	17,077	902	2,701	1,929	1,861	-	-
Total	1,870,534	5,888	10,180	10,732	24,876	55,036	103,159	109,879	198,534	169,794	158,280	424,743	466,456	105,322	27,655
Balsam poplar															
Sawtimber	578,401	-	2,049	6,146	1,885	27,916	18,216	48,734	35,721	51,921	44,972	140,537	100,771	16,929	82,604
Poletimber	186,666	-	-	5,053	8,405	18,025	10,389	12,445	13,465	34,008	6,830	43,562	21,591	12,893	-
Sapling-seedling	56,891	312	3,510	9,882	3,674	11,196	8,755	6,987	-	3,854	7,485	1,236	-	-	-
Total	821,958	312	5,559	21,081	13,964	57,137	37,360	68,166	49,186	89,783	59,287	185,335	122,362	29,822	82,604
Nonstocked	9,364	4,880	4,484	-	-	-	-	-	-	-	-	-	-	-	-
All types															
Sawtimber	24,389,542	37,934	34,924	102,550	180,455	525,249	928,806	1,051,962	1,637,542	2,226,461	2,117,606	5,703,406	6,475,321	2,637,054	730,272
Poletimber	8,546,346	-	10,812	34,120	57,553	222,268	393,806	391,728	732,363	924,498	853,155	2,147,799	1,888,258	674,576	215,410
Sapling-seedling	1,961,226	22,914	102,395	244,962	205,367	349,082	346,433	208,524	199,187	109,120	78,227	72,038	22,540	437	-
Nonstocked	9,364	4,880	4,484	-	-	-	-	-	-	-	-	-	-	-	-
Total	34,906,478	65,728	152,615	381,632	443,375	1,096,599	1,669,045	1,652,214	2,569,092	3,260,079	3,048,988	7,923,243	8,386,119	3,312,067	945,682

[1] International 1/4-inch rule.

Table 56. -- Net volume of sawtimber on timberland by species group, grade[1], and Forest Survey Unit, Minnesota, 1990

(In thousand board feet)[2]

Aspen-Birch Unit

Species group	Total	Log grade 1	2	3	4
Softwoods					
Jack pine	576,837	7,874	39,900	529,063	-
Red pine	785,692	72,349	113,272	600,071	-
White pine	648,619	140,297	182,049	309,724	16,549
White spruce	808,133	13,174	48,743	746,216	-
Black spruce	540,302	-	7,785	532,517	-
Balsam fir	1,129,014	-	7,338	1,121,676	-
Tamarack	335,588	-	19,367	316,221	-
Eastern redcedar	-	-	-	-	-
Northern white-cedar	1,498,124	13,366	132,316	1,352,442	-
Other softwoods	430	-	-	430	-
Total softwoods	6,322,739	247,060	550,770	5,508,360	16,549
Hardwoods					
Select white oak	28,445	-	-	19,232	9,213
Select red oak	38,380	3,174	11,133	22,589	1,484
Other red oak	528	-	-	528	-
Select hickory	-	-	-	-	-
Other hickory	-	-	-	-	-
Basswood	133,826	24,249	25,346	79,845	4,386
Yellow birch	50,134	14,886	9,159	20,524	5,565
Hard maple	154,930	13,214	26,247	103,208	12,261
Soft maple	72,128	1,788	4,750	48,960	16,630
Elm	60,330	12,421	18,287	23,327	6,295
Black ash	323,146	12,923	60,574	229,382	20,267
White & green ash	19,270	1,588	4,654	11,185	1,843
Cottonwood	1,829	-	-	1,829	-
Willow	698	-	-	698	-
Hackberry	-	-	-	-	-
Balsam poplar	502,247	31,654	67,143	360,420	43,030
Bigtooth aspen	89,046	2,016	29,880	54,835	2,315
Quaking aspen	3,319,888	152,409	474,654	2,470,424	222,401
Paper birch	772,195	28,153	129,097	559,766	55,179
Black cherry	-	-	-	-	-
Black walnut	-	-	-	-	-
Butternut	-	-	-	-	-
Other hardwoods	139	-	-	139	-
Total hardwoods	5,567,159	298,475	860,924	4,006,891	400,869
All species	11,889,898	545,535	1,411,694	9,515,251	417,418

Northern Pine Unit

Species group	Total	Log grade 1	2	3	4
Softwoods					
Jack pine	1,087,979	1,552	69,246	1,017,181	-
Red pine	1,551,979	173,815	338,333	1,038,803	1,028
White pine	536,186	85,633	146,962	205,538	98,053
White spruce	323,738	5,357	36,197	279,906	2,278
Black spruce	166,385	-	6,278	160,107	-
Balsam fir	702,962	-	15,373	687,589	-
Tamarack	414,141	-	18,785	395,356	-
Eastern redcedar	-	-	-	-	-
Northern white-cedar	695,044	1,672	27,804	658,645	6,923
Other softwoods	403	-	-	403	-
Total softwoods	5,478,817	268,029	658,978	4,443,528	108,282
Hardwoods					
Select white oak	423,831	20,952	85,200	272,824	44,855
Select red oak	782,740	33,652	160,395	535,319	53,374
Other red oak	12,454	-	-	10,439	2,015
Select hickory	-	-	-	-	-
Other hickory	363	-	-	363	-
Basswood	791,966	151,239	264,353	365,424	10,950
Yellow birch	21,685	2,330	4,743	12,695	1,917
Hard maple	375,473	64,966	148,355	153,641	8,511
Soft maple	167,282	33,900	41,498	90,782	1,102
Elm	256,284	14,263	83,178	158,843	-
Black ash	492,909	53,178	154,247	275,720	9,764
White & green ash	86,862	6,984	24,097	54,298	1,483
Cottonwood	466	-	-	466	-
Willow	343	-	-	343	-
Hackberry	-	-	-	-	-
Balsam poplar	586,124	19,638	90,701	444,763	31,022
Bigtooth aspen	490,503	22,969	108,785	344,429	14,320
Quaking aspen	4,467,928	135,723	724,003	3,338,907	269,295
Paper birch	737,409	34,556	147,862	519,111	35,880
Black cherry	-	-	-	-	-
Black walnut	-	-	-	-	-
Butternut	3,601	2,505	-	1,096	-
Other hardwoods	3,755	-	-	3,755	-
Total hardwoods	9,701,978	596,855	2,037,417	6,583,218	484,488
All species	15,180,795	864,884	2,696,395	11,026,746	592,770

(Table 56 continued on next page)

(Table 56 continued)

Central Hardwood Unit

Species group	Total	Log grade 1	2	3	4
Softwoods					
Jack pine	40,686	507	1,894	38,285	-
Red pine	102,823	6,171	5,842	90,810	-
White pine	109,036	8,629	52,398	34,804	13,205
White spruce	16,945	-	-	16,945	-
Black spruce	2,844	-	-	2,844	-
Balsam fir	27,349	-	-	27,349	-
Tamarack	83,830	-	2,761	75,060	6,009
Eastern redcedar	18,868	-	-	18,868	-
Northern white-cedar	-	-	-	-	-
Other softwoods	7,307	-	-	7,307	-
Total softwoods	409,688	15,307	62,895	312,272	19,214

Species group	Total	Tree grade 1	2	3	Tie & timber
Hardwoods					
Select white oak	934,179	19,176	138,865	358,031	418,107
Select red oak	1,708,405	99,374	430,261	635,918	542,852
Other red oak	104,993	6,074	13,371	22,754	62,794
Select hickory	38,654	2,193	8,655	14,739	13,067
Other hickory	7,899	-	1,310	2,440	4,149
Basswood	627,064	141,086	221,491	240,656	23,831
Yellow birch	963	-	-	963	-
Hard maple	233,654	6,205	47,112	112,972	67,365
Soft maple	228,327	9,824	15,103	78,415	124,985
Elm	238,070	27,516	48,130	85,031	77,393
Black ash	147,017	9,980	33,956	76,329	26,752
White & green ash	206,614	47,190	35,749	68,403	55,272
Cottonwood	100,839	47,936	28,502	18,160	6,241
Willow	35,930	-	-	13,477	22,453
Hackberry	12,229	-	2,796	4,928	4,505
Balsam poplar	32,620	-	4,519	11,018	17,083
Bigtooth aspen	172,392	1,877	16,337	99,826	54,352
Quaking aspen	721,339	2,949	131,118	368,097	219,175
Paper birch	114,623	-	17,104	49,247	48,272
Black cherry	24,760	-	3,260	16,206	5,294
Black walnut	39,088	-	24,051	6,519	8,518
Butternut	28,088	-	-	7,225	20,863
Other hardwoods	49,624	-	-	24,504	25,120
Total hardwoods	5,807,371	421,380	1,221,690	2,315,858	1,848,443
All species	6,217,059	436,687	1,284,585	2,628,130	1,867,657

Prairie Unit

Species group	Total	Log grade 1	2	3	4
Softwoods					
Jack pine	920	-	-	920	-
Red pine	3,702	-	-	3,702	-
White pine	3,512	-	-	3,512	-
White spruce	3,676	-	-	3,676	-
Black spruce	-	-	-	-	-
Balsam fir	-	-	-	-	-
Tamarack	1,732	-	-	1,732	-
Eastern redcedar	10,663	-	1,805	8,858	-
Northern white-cedar	-	-	-	-	-
Other softwoods	-	-	-	-	-
Total softwoods	24,205	-	1,805	22,400	-

Species group	Total	Tree grade 1	2	3	Tie & timber
Hardwoods					
Select white oak	436,776	26,780	48,461	156,854	204,681
Select red oak	108,679	4,416	27,100	47,779	29,384
Other red oak	5,701	-	-	4,596	1,105
Select hickory	742	-	-	742	-
Other hickory	2,717	-	-	1,271	1,446
Basswood	269,823	104,438	66,679	92,012	6,694
Yellow birch	-	-	-	-	-
Hard maple	40,519	8,464	11,858	12,297	7,900
Soft maple	35,701	10,943	4,879	6,075	13,804
Elm	84,178	2,641	21,210	23,558	36,769
Black ash	5,745	-	-	-	5,745
White & green ash	172,391	28,032	38,699	81,029	24,631
Cottonwood	132,240	25,860	36,632	54,639	15,109
Willow	58,155	-	7,148	-	51,007
Hackberry	11,711	-	4,184	7,527	-
Balsam poplar	36,388	-	-	15,109	21,279
Bigtooth aspen	316	-	-	316	-
Quaking aspen	143,336	-	-	48,273	95,063
Paper birch	2,435	-	-	2,435	-
Black cherry	2,048	-	-	2,048	-
Black walnut	7,691	-	3,497	4,194	-
Butternut	1,651	-	-	1,651	-
Other hardwoods	35,578	-	5,211	4,505	25,862
Total hardwoods	1,594,521	211,574	275,558	566,910	540,479
All species	1,618,726	211,574	277,363	589,310	540,479

[1]Two grading systems were used in Minnesota:
Log grades were used for softwoods throughout the State and for hardwoods in the Aspen-Birch and Northern Pine Units. Tree grades were used for hardwoods in the Central Hardwood and Prairie Units.
[2]International 1/4-inch rule.

Table 57. -- Net volume of short-log trees (cull volume) in cubic feet on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	Total	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	3,541	540	1,106	892	647	279	77	-	-
Red pine	1,702	444	568	219	134	-	-	337	-
White pine	2,186	261	370	277	212	246	191	337	292
White spruce	562	70	65	142	138	147	-	-	-
Black spruce	445	246	87	-	112	-	-	-	-
Balsam fir	2,547	750	1,475	322	-	-	-	-	-
Tamarack	2,865	630	1,375	457	117	102	-	184	-
Eastern redcedar	268	115	-	-	-	153	-	-	-
Northern white-cedar	17,274	5,026	4,921	3,370	1,889	1,078	720	187	83
Other softwoods	180	117	-	-	-	-	-	63	-
Total softwoods	31,570	8,199	9,967	5,679	3,249	2,005	988	1,108	375
Hardwoods									
Select white oak	61,098	-	10,080	8,873	8,459	9,196	5,530	13,718	5,242
Select red oak	32,267	-	3,711	5,526	5,123	4,695	3,833	8,239	1,140
Other red oak	3,845	-	929	1,011	186	438	399	767	115
Select hickory	858	-	282	257	-	127	89	103	-
Other hickory	319	-	68	105	-	146	-	-	-
Basswood	19,166	-	3,079	2,982	3,866	2,563	1,343	5,033	300
Yellow birch	1,956	-	483	405	206	318	201	343	-
Hard maple	17,619	-	2,390	3,345	4,500	2,278	2,719	2,169	218
Soft maple	12,566	-	2,220	1,535	1,377	996	799	2,619	3,020
Elm	14,781	-	2,860	2,168	2,720	1,437	1,659	2,201	1,736
Black ash	5,562	-	2,436	1,556	676	480	108	306	-
White & green ash	10,193	-	1,952	1,900	1,135	1,894	629	2,053	630
Cottonwood	1,395	-	-	-	-	76	-	493	826
Willow	3,160	-	696	375	122	480	447	542	498
Hackberry	1,420	-	121	349	392	148	-	410	-
Balsam poplar	3,088	-	512	1,302	551	-	427	183	113
Bigtooth aspen	3,383	-	510	1,021	790	244	718	100	-
Quaking aspen	49,472	-	7,901	14,941	11,550	8,553	3,020	3,372	135
Paper birch	17,862	-	7,135	4,969	3,297	1,215	911	232	103
Black cherry	723	-	356	106	261	-	-	-	-
Black walnut	988	-	171	155	399	-	195	68	-
Butternut	1,397	-	150	334	201	583	-	129	-
Other hardwoods	7,570	-	2,252	2,082	1,528	797	362	549	-
Total hardwoods	270,688	-	50,294	55,297	47,339	36,664	23,389	43,629	14,076
All species	302,258	8,199	60,261	60,976	50,588	38,669	24,377	44,737	14,451

Table 58. -- Net volume of short-log trees, (cull volume) in board feet[1] timberland by species group and diameter class, Minnesota, 1990

Species group	Total	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	12,175	1,749	3,702	3,094	2,312	1,027	291	-	-
Red pine	6,470	1,600	2,096	841	526	-	-	1,407	-
White pine	7,580	811	1,176	911	724	879	684	1,256	1,139
White spruce	2,745	320	301	680	688	756	-	-	-
Black spruce	1,450	777	288	-	385	-	-	-	-
Balsam fir	7,221	2,082	4,191	948	-	-	-	-	-
Tamarack	11,849	2,500	5,612	1,913	506	455	-	863	-
Eastern redcedar	1,268	510	-	-	-	758	-	-	-
Northern white-cedar	60,284	17,124	16,835	11,762	6,795	3,991	2,712	727	338
Other softwoods	836	514	-	-	-	-	-	322	-
Total softwoods	111,878	27,987	34,201	20,149	11,936	7,866	3,687	4,575	1,477
Hardwoods									
Select white oak	150,271	-	21,889	20,515	20,383	22,794	14,069	36,131	14,490
Select red oak	69,435	-	6,939	11,159	10,769	10,235	8,523	19,039	2,771
Other red oak	8,418	-	1,778	2,156	409	984	927	1,869	295
Select hickory	1,937	-	554	582	-	308	224	269	-
Other hickory	720	-	129	228	-	363	-	-	-
Basswood	40,432	-	5,785	5,994	8,096	5,500	2,933	11,415	709
Yellow birch	4,687	-	1,052	936	497	785	505	912	-
Hard maple	39,751	-	4,770	7,174	10,151	5,299	6,437	5,357	563
Soft maple	32,922	-	4,866	3,689	3,446	2,591	2,111	7,212	9,007
Elm	37,877	-	6,393	5,201	6,864	3,759	4,457	6,136	5,067
Black ash	12,627	-	5,283	3,531	1,597	1,172	263	781	-
White & green ash	22,338	-	3,767	3,978	2,469	4,257	1,448	4,869	1,550
Cottonwood	5,236	-	-	-	-	254	-	1,785	3,197
Willow	10,401	-	1,886	1,106	394	1,568	1,494	1,948	2,005
Hackberry	3,680	-	275	850	1,004	393	-	1,158	-
Balsam poplar	7,580	-	1,156	3,108	1,379	-	1,113	492	332
Bigtooth aspen	5,578	-	756	1,650	1,320	421	1,255	176	-
Quaking aspen	105,038	-	15,413	30,996	24,840	18,871	6,802	7,791	325
Paper birch	41,294	-	15,537	11,548	7,977	3,026	2,314	609	283
Black cherry	1,548	-	719	237	592	-	-	-	-
Black walnut	2,305	-	351	354	940	-	488	172	-
Butternut	3,282	-	310	763	469	1,417	-	323	-
Other hardwoods	22,772	-	6,496	6,130	4,665	2,525	1,158	1,798	-
Total hardwoods	630,129	-	106,104	121,885	108,261	86,522	56,521	110,242	40,594
All species	742,007	27,987	140,305	142,034	120,197	94,388	60,208	114,817	42,071

[1] International 1/4-inch rule.

Table 59. -- Current annual growth of growing stock and sawtimber on timberland, 1976 and 1989, and average net annual growth of growing stock and sawtimber, 1977-1989 by softwoods and hardwoods and Forest Survey Unit, Minnesota

Forest Survey Unit and softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual growth 1976	Average net annual growth 1977-1989	Current annual growth 1989	Current annual growth 1976	Average net annual growth 1977-1989	Current annual growth 1989
	(In thousand cubic feet)			*(In thousand board feet)* [1]		
Aspen-Birch Unit						
Softwoods	41,407	55,702	60,331	129,982	210,980	232,813
Hardwoods	61,154	76,598	85,114	161,785	235,800	278,985
Total	102,561	132,300	145,445	291,767	446,780	511,798
Northern Pine Unit						
Softwoods	36,461	51,975	57,818	124,659	203,533	240,737
Hardwoods	109,996	121,605	142,962	322,540	410,386	502,614
Total	146,457	173,580	200,780	447,199	613,919	743,351
Central Hardwood Unit						
Softwoods	3,521	5,414	6,725	10,251	19,936	30,229
Hardwoods	51,510	47,428	68,643	155,903	192,699	259,313
Total	55,031	52,842	75,368	166,154	212,635	289,542
Prairie Unit						
Softwoods	48	477	466	120	991	1,321
Hardwoods	10,793	10,643	17,778	23,431	37,869	56,612
Total	10,841	11,120	18,244	23,551	38,860	57,933
All Units						
Softwoods	81,437	113,568	125,340	265,012	435,440	505,100
Hardwoods	233,453	256,274	314,497	663,659	876,754	1,097,524
Total	314,890	369,842	439,837	928,671	1,312,194	1,602,624

[1] International 1/4-inch rule.

Table 60. -- Average net annual growth of growing stock on timberland by species group and ownership class, Minnesota 1977-1989

(In thousand cubic feet)

Species group	All owners	Ownership class								
		National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Softwoods										
Jack pine	11,258	1,382	45	79	1,467	2,076	137	1,792	3,953	327
Red pine	23,874	7,629	43	221	3,989	3,232	675	1,784	5,881	420
White pine	8,838	2,565	-	198	928	1,182	573	253	2,641	498
White spruce	12,913	4,067	51	86	2,354	2,151	254	979	2,588	383
Black spruce	11,506	2,015	54	86	3,248	2,153	489	817	2,126	518
Balsam fir	17,211	2,836	23	79	2,809	3,158	308	1,425	5,394	1,179
Tamarack	12,375	795	10	130	5,010	2,113	757	308	2,929	323
Eastern redcedar	649	-	-	-	62	15	-	-	572	-
Northern white-cedar	14,752	2,000	77	226	6,335	2,064	1,023	1,194	1,336	497
Other softwoods	190	-	-	-	1	-	-	-	143	46
Total softwoods	113,566	23,289	303	1,105	26,203	18,144	4,216	8,552	27,563	4,191
Hardwoods										
Select white oak	113,566	369	3	239	1,170	1,236	403	127	10,945	522
Select red oak	18,005	381	-	497	1,965	2,591	233	162	11,526	650
Other red oak	417	8	-	51	26	-63	5	-	403	-13
Select hickory	448	-	-	-	10	-	2	-	423	13
Other hickory	419	-	-	3	25	-4	-	-	384	11
Basswood	17,657	1,351	-	368	1,803	3,225	405	540	9,493	472
Yellow birch	104	95	-	-	24	9	-	-	-25	1
Hard maple	12,429	1,403	13	173	1,694	3,384	317	466	4,497	482
Soft maple	15,083	1,797	-	662	2,096	3,168	254	628	5,642	836
Elm	-11,720	-352	-4	-421	-1,074	-1,210	266	-465	-8,095	-365
Black ash	18,684	1,117	29	147	2,870	4,134	693	623	8,254	817
White & green ash	6,926	212	20	259	670	488	98	112	4,767	300
Cottonwood	1,205	2	-	150	154	69	-	-	820	10
Willow	506	-	-	27	-85	14	-	6	525	19
Hackberry	406	-	-	6	4	-	-	-	350	46
Balsam poplar	9,382	235	18	109	2,581	1,192	524	630	3,777	316
Bigtooth aspen	8,489	1,186	4	19	1,061	1,585	200	239	3,921	274
Quaking aspen	115,726	14,069	40	1,088	19,592	23,005	3,801	6,275	42,606	5,250
Paper birch	23,714	4,766	2	32	3,008	5,949	629	1,086	6,937	1,305
Black cherry	409	21	-	3	17	21	-	-6	331	22
Black walnut	465	-	-	-	34	1	-	-	404	26
Butternut	689	-	-	-	53	-	-	4	626	6
Other hardwoods	1,819	-	-	17	145	46	-2	9	1,578	26
Total hardwoods	256,276	26,660	125	3,429	37,843	48,840	7,828	10,436	110,089	11,026
All species	369,842	49,949	428	4,534	64,046	66,984	12,044	18,988	137,652	15,217

Table 61. -- Average net annual growth of sawtimber on timberland by species group and ownership class, Minnesota 1977-1989

(In thousand board feet)[1]

Species group	All owners	Ownership class								
		National forest	Bureau of Land Mgmt.	Other federal	State	County and municipal	Indian	Forest industry	Individual	Corporate
Softwoods										
Jack pine	48,505	5,988	543	417	6,415	9,624	360	4,927	19,182	1,049
Red pine	94,000	34,139	348	1,093	14,759	13,070	3,475	5,908	19,122	2,086
White pine	48,421	14,535	-	991	5,081	6,197	2,590	1,449	14,229	3,349
White spruce	52,414	15,245	154	435	9,170	9,672	1,042	3,991	10,699	2,006
Black spruce	24,506	7,839	13	263	6,694	3,240	410	1,134	3,711	1,202
Balsam fir	65,840	13,781	39	242	7,418	13,635	1,947	4,504	20,690	3,584
Tamarack	38,135	5,271	66	374	12,199	4,733	2,280	907	11,210	1,095
Eastern redcedar	1,433	-	-	-	-	-	-	-	1,433	-
Northern white-cedar	61,170	11,018	291	375	21,465	10,142	3,800	5,657	5,817	2,605
Other softwoods	967	-	-	-	-	-	-	-	426	541
Total softwoods	435,391	107,816	1,454	4,190	83,201	70,313	15,904	28,477	106,519	17,517
Hardwoods										
Select white oak	58,803	648	2	1,032	3,876	2,746	818	195	47,449	2,037
Select red oak	91,792	1,056	-	2,822	10,847	10,730	1,134	530	61,373	3,300
Other red oak	3,470	31	-	109	317	235	21	-	2,816	-59
Select hickory	1,512	-	-	-	104	-	12	-	1,382	14
Other hickory	615	-	-	14	35	6	-	-	551	9
Basswood	59,232	4,297	-	1,140	5,531	8,566	1,738	2,136	34,231	1,593
Yellow birch	1,041	563	-	-	39	235	-	21	158	25
Hard maple	25,189	3,483	-	403	3,081	4,875	624	853	11,107	763
Soft maple	21,546	1,435	-	3,557	2,501	2,923	21	588	9,034	1,487
Elm	-42,458	-341	5	-603	-2,613	-3,776	144	-1,436	-33,124	-714
Black ash	39,200	2,249	86	469	5,446	8,849	814	1,313	18,681	1,293
White & green ash	22,681	572	53	890	2,103	1,129	146	276	16,501	1,011
Cottonwood	6,717	-	-	703	771	270	-	-	4,777	196
Willow	2,918	-	-	379	-158	19	-	29	2,480	169
Hackberry	531	-	-	-	-	-	-	-	526	5
Balsam poplar	30,614	3,287	-14	325	5,981	5,775	1,192	2,262	10,999	807
Bigtooth aspen	39,376	4,368	41	118	5,508	7,612	674	1,050	19,062	943
Quaking aspen	443,100	63,920	650	4,240	68,927	101,141	16,663	20,938	145,967	20,654
Paper birch	62,209	12,148	17	617	7,626	13,419	2,058	2,223	21,111	2,990
Black cherry	1,506	-	-	-	221	6	-	-	1,229	50
Black walnut	1,685	-	-	-	200	6	-	-	1,366	113
Butternut	3,131	-	-	2	137	-	-	21	2,879	92
Other hardwoods	2,393	-	-	23	201	33	-9	-	2,084	61
Total hardwoods	876,803	97,716	840	16,240	120,681	164,799	26,050	30,999	382,639	36,839
All species	1,312,194	205,532	2,294	20,430	203,882	235,112	41,954	59,476	489,158	54,356

[1] International 1/4-inch rule.

Table 62. -- Average net annual growth of growing stock on timberland by species group and forest type, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	11,258	8,311	1,001	-18	58	155	290	-1	94	226	-17	34	1,149	-75	18	33
Red pine	23,874	1,698	16,183	426	609	168	209	18	67	285	19	209	3,133	739	109	2
White pine	8,838	304	1,094	2,242	645	118	164	64	67	271	31	1,044	2,027	744	23	-
White spruce	12,913	452	447	157	2,315	2,728	285	-53	103	122	339	375	4,616	774	250	3
Black spruce	11,506	150	83	24	772	124	9,605	-978	679	-7	-16	6	993	72	2	-3
Balsam fir	17,211	425	350	9	5,887	-192	625	-1,687	166	36	323	-190	9,793	1,502	190	-26
Tamarack	12,375	20	17	8	310	-4	2,646	365	8,262	1	-10	5	409	139	130	77
Eastern redcedar	649	-	-	-	-	-	14	-	-	430	7	127	48	23	-	-
Northern white-cedar	14,752	-	35	26	827	75	483	10,583	437	-	743	202	671	491	179	-
Other softwoods	190	139	-	-	-	11	-	-	-	24	-	-	16	-	-	-
Total softwoods	113,566	11,499	19,210	2,874	11,423	3,183	14,321	8,311	9,875	1,388	1,419	1,812	22,855	4,409	901	86
Hardwoods																
Select white oak	15,014	70	119	12	42	9	-	1	11	7,463	933	2,129	3,885	296	39	5
Select red oak	18,005	71	92	3	5	4	4	-	31	11,356	189	1,886	3,529	794	41	-
Other red oak	417	-	-24	-	-	-	-	-	-	283	11	18	83	39	7	-
Select hickory	448	-	-	-	-	-	-	-	-	410	-	28	3	7	-	-
Other hickory	419	-	-	-	-	-	-	-	-	280	17	117	4	1	-	-
Basswood	17,657	17	30	7	24	2	-	3	8	1,903	815	10,306	3,988	480	74	-
Yellow birch	104	-	-	-	8	18	-	-21	-	15	-39	72	54	-5	2	-
Hard maple	12,429	-	82	20	29	16	3	13	-	837	441	8,000	2,221	711	56	-
Soft maple	15,083	72	119	120	296	56	86	-3	30	697	2,349	3,006	6,840	1,362	53	-
Elm	-11,720	-7	-6	-17	-43	-	13	-33	27	-375	-5,473	-4,387	-944	-73	-382	-20
Black ash	18,684	26	8	1	306	8	31	168	137	327	11,294	1,465	3,473	678	728	34
White & green ash	6,926	-	11	1	3	7	-	-20	-	588	1,800	3,442	951	99	38	6
Cottonwood	1,205	-	3	-	-	-	2	-	-	184	1,025	1	-34	5	-	19
Willow	506	-	31	-	-	-	-	-	-	16	434	53	-28	-	-	-
Hackberry	406	-	-	-	-	-	-	-	-	176	91	139	-	-	-	-
Balsam poplar	9,382	5	7	13	321	6	56	-125	81	21	-52	-145	3,877	263	4,978	76
Bigtooth aspen	8,489	147	169	3	22	8	12	24	6	494	12	582	6,610	394	6	-
Quaking aspen	115,726	1,441	1,012	69	2,511	586	1,430	75	280	2,041	1,650	2,013	97,304	3,227	2,131	-44
Paper birch	23,714	464	479	119	1,088	168	239	-107	77	451	70	891	10,257	9,259	239	20
Black cherry	409	-	-	-	-	-	-	-	-	106	-3	222	56	38	-10	-
Black walnut	465	-	2	-	-	-	-	-	-	332	91	38	2	-	-	-
Butternut	689	-	-	-	-	-	-	-	-	521	59	102	7	-	-	-
Other hardwoods	1,819	-	-	-	-	-	-	-	-	311	873	483	108	11	33	-
Total hardwoods	256,276	2,306	2,134	351	4,612	888	1,876	-25	688	28,437	16,587	30,461	142,246	17,586	8,033	96
All species	369,842	13,805	21,344	3,225	16,035	4,071	16,197	8,286	10,563	29,825	18,006	32,273	165,101	21,995	8,934	182

Table 63. -- Average net annual growth of sawtimber on timberland by species group and forest type, Minnesota, 1977-1989

(In thousand board feet)[1]

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	48,505	34,444	3,663	280	-114	415	658	46	345	1,277	-45	449	7,072	-228	68	175
Red pine	94,000	7,248	59,818	2,231	2,533	545	642	102	255	1,663	112	1,088	14,234	3,137	380	12
White pine	48,421	1,336	5,987	12,020	3,591	859	761	368	353	1,520	217	5,984	11,312	4,004	109	-
White spruce	52,414	2,092	1,433	681	8,681	6,487	1,101	-130	44	666	1,938	2,073	22,213	3,663	1,451	21
Black spruce	24,506	644	154	87	3,879	293	15,470	-1,588	1,147	-38	123	73	4,085	173	3	1
Balsam fir	65,840	1,782	1,143	260	18,904	283	1,890	-2,278	762	97	2,133	-654	34,123	5,753	1,642	-
Tamarack	38,135	19	43	-	1,706	-20	6,332	1,750	23,901	6	1,240	-1	1,546	632	744	237
Eastern redcedar	1,433	-	-	-	-	-	-	-	-	905	36	292	128	72	-	-
Northern white-cedar	61,170	-	110	94	4,988	278	1,279	40,952	1,679	-	4,051	1,078	3,659	2,067	934	1
Other softwoods	967	823	-	-	-	-	-	-	-	105	-	-	39	-	-	-
Total softwoods	435,391	48,388	72,351	15,653	44,168	9,140	28,133	39,222	28,486	6,201	9,805	10,382	98,411	19,273	5,331	447
Hardwoods																
Select white oak	58,803	128	178	53	158	3	-	7	-	35,718	2,301	10,030	9,497	631	73	26
Select red oak	91,792	205	179	10	28	-	71	-	123	60,883	606	10,746	15,569	3,195	177	-
Other red oak	3,470	-	47	-	-	-	-	-	-	2,541	12	251	385	197	37	-
Select hickory	1,512	-	-	-	-	-	-	-	-	1,337	-	123	10	42	-	-
Other hickory	615	-	-	-	-	-	-	-	-	425	-	184	-	6	-	-
Basswood	59,232	-	-	28	109	-	-	15	22	5,981	3,044	40,218	8,387	1,287	141	-
Yellow birch	1,041	-	-	-	171	41	2	-46	-	-	56	660	45	112	-	-
Hard maple	25,189	-	-	34	35	28	-	2	-	1,069	977	20,432	1,888	675	49	-
Soft maple	21,546	-	8	223	311	12	191	130	69	1,222	9,272	4,562	4,833	631	82	-
Elm	-42,458	-	1	16	-108	-	39	-147	11	-1,724	-18,684	-19,629	-911	-305	-1,017	-
Black ash	39,200	-	-	35	377	1	-	224	94	789	26,285	4,037	5,210	1,125	1,005	18
White & green ash	22,681	-	34	6	-	-	-	-28	-	2,284	6,383	11,952	1,521	319	180	30
Cottonwood	6,717	-	52	-	-	-	-	-	-	1,051	5,321	107	-3	24	-	165
Willow	2,918	-	-	-	-	-	-	-	-	5	2,768	130	15	-	-	-
Hackberry	531	-	-	-	-	-	-	-	-	240	102	189	-	-	-	-
Balsam poplar	30,614	-	105	28	1,150	34	78	-493	51	-102	1,645	396	11,445	1,917	14,200	160
Bigtooth aspen	39,376	181	720	28	91	63	-	43	33	2,466	270	2,512	30,827	2,142	-	-
Quaking aspen	443,100	3,835	3,011	420	9,390	2,284	3,990	133	1,477	10,651	7,725	12,821	366,637	15,306	5,339	81
Paper birch	62,209	898	1,003	626	2,584	-76	393	188	344	2,627	951	6,318	23,439	22,436	452	26
Black cherry	1,506	-	-	-	-	-	-	-	-	492	248	745	21	-	-	-
Black walnut	1,685	-	-	-	-	-	-	-	-	1,328	202	124	26	5	-	-
Butternut	3,131	-	-	-	-	-	-	-	-	2,238	100	643	149	1	-	-
Other hardwoods	2,393	-	-	-	-	-	-	-	-	275	1,721	319	78	-	-	-
Total hardwoods	876,803	5,247	5,338	1,507	14,296	2,390	4,764	28	2,224	131,796	51,305	107,870	479,068	49,746	20,718	506
All species	1,312,194	53,635	77,689	17,160	58,464	11,530	32,897	39,250	30,710	137,997	61,110	118,252	577,479	69,019	26,049	953

[1] International 1/4-inch rule.

Table 64. -- Current net annual growth, current annual mortality, 1989, and current annual removals, 1988, growing stock and sawtimber on timberland by species group, Minnesota

Species group	Growing stock			Sawtimber		
	Current annual net growth[1] 1989	Current annual mortality 1989	Current annual removals[2] 1988	Current annual net growth[1] 1989	Current annual mortality 1989	Current annual removals[2] 1988
	(In thousand cubic feet)			*(In thousand board feet)* [3]		
Softwoods						
Jack pine	9,505	11,253	15,506	46,211	37,754	55,730
Red pine	25,379	88	11,380	100,007	1,065	53,683
White pine	10,343	191	4,110	56,294	2,427	22,412
White spruce	16,062	1,596	3,877	68,389	6,837	9,893
Black spruce	11,091	15,094	9,825	26,285	15,162	25,066
Balsam fir	22,307	28,316	14,984	94,803	50,914	35,531
Tamarack	12,846	4,915	1,110	45,970	7,070	2,271
Eastern redcedar	777	3	-	2,430	18	-
Northern white-cedar	16,844	1,080	2,423	63,628	7,273	4,302
Other softwoods	186	-	-	1,083	-	-
Total softwoods	125,340	62,536	63,215	505,100	128,520	208,888
Hardwoods						
Select white oak	17,901	154	4,910	63,729	2,418	15,126
Select red oak	19,341	7,605	11,897	100,908	23,381	42,725
Other red oak	862	287	-	5,057	517	-
Select hickory	473	25	-	1,598	118	-
Other hickory	419	49	-	499	28	-
Basswood	20,444	3,460	4,253	67,034	11,169	19,174
Yellow birch	174	343	65	759	1,137	313
Hard maple	15,310	963	1,827	28,124	3,149	4,531
Soft maple	18,918	3,617	1,908	30,058	2,910	4,624
Elm	6,339	8,083	4,583	9,213	20,424	13,286
Black ash	21,435	4,598	3,414	43,429	7,742	10,263
White & green ash	8,625	525	1,040	30,649	1,297	3,126
Cottonwood	1,322	118	1,189	7,234	568	4,802
Willow	577	291	-	3,122	1,010	-
Hackberry	537	46	-	525	169	-
Balsam poplar	13,564	14,203	5,072	50,687	28,526	11,866
Bigtooth aspen	9,409	3,215	9,812	46,144	8,310	27,301
Quaking aspen	124,024	75,184	134,252	508,390	164,881	373,534
Paper birch	28,117	20,276	12,665	81,491	21,225	34,666
Black cherry	806	21	-	1,435	64	-
Black walnut	452	7	-	1,990	117	-
Butternut	1,366	47	-	3,581	136	-
Other hardwoods	4,082	2,402	1,101	11,868	10,449	2,910
Total hardwoods	314,497	145,519	197,988	1,097,524	309,745	568,247
All species	439,837	208,055	261,203	1,602,624	438,265	777,135

[1] An estimate of current gross growth may be computed by adding current mortality to current net growth.
[2] Based on data from a 1988 mill survey, a 1989-1990 logging utilization study, and land-use change estimates from the new inventory.
[3] International 1/4-inch rule.

Table 65. -- Current annual removals for 1976 and 1988, and average annual removals for 1977-1989 from growing stock and sawtimber on timberland by softwoods and hardwoods and Forest Survey Unit, Minnesota

Forest Survey Unit and softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual removals 1976 [1]	Average annual removals 1977-1989 [2]	Current annual removals 1988 [1]	Current annual removals 1976 [1]	Average annual removals 1977-1989 [2]	Current annual removals 1988 [1]
	(In thousand cubic feet)			*(In thousand board feet)* [3]		
Aspen-Birch Unit						
Softwoods	38,803	32,189	34,252	93,268	86,092	106,517
Hardwoods	38,445	50,168	68,272	84,758	93,089	184,967
Total	77,248	82,357	102,524	178,026	179,181	291,484
Northern Pine Unit						
Softwoods	28,502	22,237	27,360	73,651	74,226	96,930
Hardwoods	44,926	68,513	90,339	108,755	146,153	260,092
Total	73,428	90,750	117,699	182,406	220,379	357,022
Central Hardwood Unit						
Softwoods	1,339	471	1,573	2,766	1,591	5,396
Hardwoods	32,858	29,289	32,750	79,236	95,365	104,485
Total	34,197	29,760	34,323	82,002	96,956	109,881
Prairie Unit						
Softwoods	156	22	30	257	-	45
Hardwoods	8,571	7,173	6,627	17,616	18,834	18,703
Total	8,727	7,195	6,657	17,873	18,834	18,748
All Units						
Softwoods	68,800	54,919	63,215	169,942	161,909	208,888
Hardwoods	124,800	155,143	197,988	290,365	353,441	568,247
Total	193,600	210,062	261,203	460,307	515,350	777,135

[1]Based on data from a mill survey and a logging utilization study for given years, and land use change estimates from the plot inventory.

[2]Average of field plot level removals between the study periods.

[3]International 1/4-inch rule.

Table 66. -- Current annual mortality for 1976 and 1989, and average annual mortality for 1977-1989 of growing stock and sawtimber on timberland by softwoods and hardwoods, Minnesota

Softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual mortality 1976	Average annual mortality 1977-1989	Current annual mortality 1989	Current annual mortality 1976	Average annual mortality 1977-1989	Current annual mortality 1989
	(In thousand cubic feet)			*(In thousand board feet)* [1]		
Softwoods	47,641	66,418	62,536	86,960	142,593	128,520
Hardwoods	121,702	154,382	145,519	216,265	315,432	309,745
All species	169,343	220,800	208,055	303,225	458,025	438,265

[1] International 1/4-inch rule.

Table 67. -- Average annual mortality of growing stock on timberland by species group and cause of death, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All causes	Cause of death							
		Insects	Disease	Weather	Animals	Fire	Suppression	Human caused	Other and unknown
Softwoods									
Jack pine	10,340	1,139	4,142	2,046	1,926	143	211	395	338
Red pine	386	163	22	141	-	2	16	42	-
White pine	992	74	560	246	79	23	2	7	1
White spruce	2,053	633	290	955	14	-	10	151	-
Black spruce	14,078	1,133	4,123	8,007	124	30	127	285	249
Balsam fir	32,256	12,572	5,750	11,607	401	378	193	1,261	94
Tamarack	4,454	255	1,385	2,037	460	99	3	34	181
Eastern redcedar	30	-	-	-	-	-	-	30	-
Northern white-cedar	1,829	16	791	868	-	-	27	100	27
Total softwoods	66,418	15,985	17,063	25,907	3,004	675	589	2,305	890
Hardwoods									
Select white oak	1,004	28	228	115	89	467	9	68	-
Select red oak	7,015	271	4,455	1,467	23	350	76	319	54
Other red oak	480	-	239	188	-	13	-	-	40
Select hickory	48	-	26	-	-	-	-	22	-
Other hickory	39	-	39	-	-	-	-	-	-
Basswood	3,118	31	1,344	1,092	167	27	-	413	44
Yellow birch	278	-	219	59	-	-	-	-	-
Hard maple	1,074	-	645	253	59	47	-	54	16
Soft maple	2,226	4	1,117	859	41	35	-	114	56
Elm	27,087	126	25,704	955	43	68	-	167	24
Black ash	3,800	26	1,741	1,462	161	128	26	151	105
White & green ash	525	-	292	146	68	-	-	19	-
Cottonwood	332	2	60	258	12	-	-	-	-
Willow	351	-	51	255	-	38	-	6	1
Hackberry	92	-	-	30	12	-	-	50	-
Balsam poplar	14,955	166	6,872	6,366	610	304	43	502	92
Bigtooth aspen	2,605	49	1,989	476	63	-	5	-	23
Quaking aspen	67,211	1,039	49,139	11,140	2,562	1,377	283	1,114	557
Paper birch	21,010	713	13,684	4,113	363	109	145	1,260	623
Black cherry	132	-	79	42	-	-	5	-	6
Black walnut	20	-	-	-	-	-	-	-	20
Butternut	104	-	104	-	-	-	-	-	-
Other hardwoods	876	29	198	525	29	-	-	87	8
Total hardwoods	154,382	2,484	108,225	29,801	4,302	2,963	592	4,346	1,669
All species	220,800	18,469	125,288	55,708	7,306	3,638	1,181	6,651	2,559

Table 68. -- Average annual mortality of sawtimber on timberland by species group and cause of death, Minnesota, 1977-1989

(In thousand board feet)[1]

Species group	All causes	Cause of death							
		Insects	Disease	Weather	Animals	Fire	Suppression	Human caused	Other and unknown
Softwoods									
Jack pine	33,897	3,932	13,578	6,980	7,323	351	65	414	1,254
Red pine	2,009	905	155	794	27	17	-	106	5
White pine	5,500	416	2,979	1,415	494	150	7	4	35
White spruce	8,568	2,464	1,365	4,354	2	-	2	371	10
Black spruce	15,744	1,095	3,814	10,180	188	-	-	119	348
Balsam fir	62,000	17,373	15,633	25,608	821	1,122	102	1,244	97
Tamarack	7,678	666	2,375	3,552	579	248	-	73	185
Eastern redcedar	52	-	-	-	-	-	-	-	52
Northern white-cedar	7,145	44	3,768	3,079	5	-	-	62	187
Total softwoods	142,593	26,895	43,667	55,962	9,439	1,888	176	2,393	2,173
Hardwoods									
Select white oak	3,359	62	607	454	96	2,039	-	99	2
Select red oak	18,511	447	12,428	4,064	75	723	-	533	241
Other red oak	1,254	-	760	424	3	3	-	-	64
Select hickory	85	-	-	-	-	-	-	-	85
Other hickory	117	-	115	-	-	-	-	2	-
Basswood	8,898	56	4,072	3,623	282	112	-	642	111
Yellow birch	862	-	756	106	-	-	-	-	-
Hard maple	2,580	-	1,439	886	30	149	-	18	58
Soft maple	2,073	-	1,246	780	5	-	-	5	37
Elm	77,010	397	73,977	1,828	108	252	-	362	86
Black ash	6,127	59	3,354	2,471	93	2	-	-	148
White & green ash	1,010	6	331	382	258	-	-	11	22
Cottonwood	1,181	-	199	980	2	-	-	-	-
Willow	1,035	-	221	788	-	-	-	26	-
Hackberry	348	-	-	134	-	-	-	214	-
Balsam poplar	30,426	264	15,320	13,696	338	96	-	551	161
Bigtooth aspen	5,180	43	4,201	885	12	-	-	-	39
Quaking aspen	132,963	1,400	103,520	21,005	3,211	1,692	72	1,205	858
Paper birch	20,615	379	15,945	2,879	110	163	-	639	500
Black cherry	178	-	-	-	178	-	-	-	-
Black walnut	132	-	33	66	-	-	-	33	-
Butternut	138	-	138	-	-	-	-	-	-
Other hardwoods	1,350	-	1,011	95	-	-	-	244	-
Total hardwoods	315,432	3,113	239,673	55,546	4,801	5,231	72	4,584	2,412
All species	458,025	30,008	283,340	111,508	14,240	7,119	248	6,977	4,585

[1] International 1/4-inch rule.

Table 69. -- Current annual timber removals of growing stock and sawtimber on timberland by species group, product, logging residue,and other removals, Minnesota, 1988

Species group	All removals	All products removals	Saw logs	Veneer logs	Cooperage	Pulpwood[1]	Piling	Poles	Fuelwood	Posts	Misc. products	Logging residue	Other removals
		Removals for products (Item)										Nonproduct removals	
		(In thousand cubic feet)											
Growing stock													
Softwoods													
Jack pine	15,506	14,301	6,783	-	-	6,692	27	40	210	270	279	795	410
Red pine	11,380	10,600	7,266	-	-	1,906	502	347	175	329	75	424	356
White pine	4,110	3,580	3,408	2	-	147	-	3	13	4	3	99	431
Spruce	13,702	12,466	1,447	-	-	11,011	-	-	7	-	1	360	876
Balsam fir	14,984	13,703	809	-	-	12,889	-	-	3	-	2	346	935
Tamarack	1,110	896	48	-	-	809	-	-	29	10	-	20	194
Cedar	2,423	1,923	436	-	-	-	-	-	-	1,487	-	69	431
Total softwoods	63,215	57,469	20,197	2	-	33,454	529	390	437	2,100	360	2,113	3,633
Hardwoods													
White oak	4,910	2,602	1,266	24	37	-	-	-	1,275	-	-	417	1,891
Red oak	11,897	8,315	5,926	144	1	-	-	-	2,244	-	-	1,903	1,679
Basswood	4,253	2,567	2,265	260	3	-	-	-	39	-	-	577	1,109
Yellow birch	65	51	47	4	-	-	-	-	-	-	-	11	3
Hard maple	1,827	1,223	255	8	-	-	-	-	930	-	30	62	542
Soft maple	1,908	1,493	375	52	-	411	-	-	604	-	51	114	301
Elm	4,583	2,493	1,276	19	-	-	-	-	1,198	-	-	301	1,789
Ash	4,454	2,491	1,496	72	-	162	-	-	761	-	-	364	1,599
Cottonwood	1,189	692	626	52	-	-	-	-	14	-	-	158	339
Balsam poplar	5,072	3,552	79	-	-	3,473	-	-	-	-	-	198	1,322
Aspen	144,064	131,237	14,582	556	-	112,386	-	-	1,252	-	2,461	7,906	4,921
Paper birch	12,665	10,542	2,070	1,159	-	975	-	-	6102	-	236	802	1,321
Other hardwoods	1,101	272	223	14	-	-	-	-	35	-	-	51	778
Total hardwoods	197,988	167,530	30,486	2,364	41	117,407	-	-	14,454	-	2,778	12,864	17,594
All species	261,203	224,999	50,683	2,366	41	150,861	529	390	14,891	2,100	3,138	14,977	21,227
						Sawtimber							
						(In thousand board feet)[2]							
Softwoods													
Jack pine	55,730	53,367	30,966	-	-	20,757	123	116	388	115	902	1,317	1,046
Red pine	53,683	51,290	41,360	-	-	5,903	2,316	1,000	328	140	243	637	1,756
White pine	22,412	19,916	19,391	13	-	464	-	12	26	1	9	170	2,326
Spruce	34,959	32,361	6,617	-	-	25,728	-	-	13	-	3	762	1,836
Balsam fir	35,531	33,833	3,710	-	-	30,112	-	-	5	-	6	747	951
Tamarack	2,271	2,173	225	-	-	1,891	-	-	53	4	-	45	53
Cedar	4,302	2,644	2,003	-	-	-	-	-	1	640	-	71	1,587
Total softwoods	208,888	195,584	104,272	13	-	84,855	2,439	1,128	814	900	1,163	3,749	9,555
Hardwoods													
White oak	15,126	9,484	6,706	149	280	-	-	-	2,349	-	-	564	5,078
Red oak	42,725	36,303	31,222	936	10	-	-	-	4,135	-	-	2,455	3,967
Basswood	19,174	14,289	12,522	1,676	18	-	-	-	73	-	-	674	4,211
Yellow birch	313	299	265	34	-	-	-	-	-	-	-	14	-
Hard maple	4,531	3,352	1,423	58	-	-	-	-	1,716	-	155	99	1,080
Soft maple	4,624	4,238	2,081	345	-	424	-	-	1,125	-	263	159	227
Elm	13,286	9,426	7,091	133	-	-	-	-	2,202	-	-	347	3,513
Ash	13,389	10,376	8,296	470	-	208	-	-	1,402	-	-	423	2,590
Cottonwood	4,802	3,849	3,493	330	-	-	-	-	26	-	-	179	774
Balsam poplar	11,866	10,227	300	-	-	9,927	-	-	-	-	-	88	1,551
Aspen	400,835	390,022	55,002	3,592	-	316,296	-	-	2,309	-	12,823	6,071	4,742
Paper birch	34,666	33,183	11,487	7,477	-	1,741	-	-	11,249	-	1,229	1,060	423
Other hardwoods	2,910	1,429	1,267	95	-	-	-	-	67	-	-	62	1,419
Total hardwoods	568,247	526,477	141,155	15,295	308	328,596	-	-	26,653	-	14,470	12,195	29,575
All species	777,135	722,061	245,427	15,308	308	413,451	2,439	1,128	27,467	900	15,633	15,944	39,130

[1] Includes particleboard.

[2] International 1/4-inch rule.

Table 70. -- Total volume of wood fiber used for each primary product, by softwoods and hardwoods, and source of material, Minnesota, 1988

Product and softwoods and hardwoods	Standard units	Total		Roundwood products				Plant byproducts[1]	
				Growing stock		Nongrowing stock			
		Number of units	Thousand cubic feet[2]	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Saw logs									
Softwoods	*Thousand*	112,078	20,756	109,060	20,197	3,018	559	-	-
Hardwoods	*board feet* [3]	195,077	34,391	172,927	30,486	22,150	3,905	-	-
Total		307,155	55,147	281,986	50,683	25,169	4,464	-	-
Veneer logs									
Softwoods	*Thousand*	14	2	14	2	-	-	-	-
Hardwoods	*board feet* [3]	16,159	2,611	14,630	2,364	1,529	247	-	-
Total		16,173	2,613	14,644	2,366	1,529	247	-	-
Cooperage									
Softwoods	*Thousand*	-	-	-	-	-	-	-	-
Hardwoods	*board feet* [3]	344	46	307	41	37	5	-	-
Total		344	46	307	41	37	5	-	-
Pulpwood[4]									
Softwoods	*Standard*	498,470	39,153	425,914	33,454	22,085	1,712	50,471	3,987
Hardwoods	*cords*	1,598,637	125,835	1,491,566	117,407	77,377	6,082	29,694	2,346
Total		2,097,107	164,988	1,917,480	150,861	99,462	7,794	80,165	6,333
Piling									
Softwoods	*Thousand*	813	529	813	529	-	-	-	-
Hardwoods	*linear feet*	-	-	-	-	-	-	-	-
Total		813	529	813	529	-	-	-	-
Poles									
Softwoods		66,320	395	65,481	390	839	5	-	-
Hardwoods	*Pieces*	-	-	-	-	-	-	-	-
Total		66,320	395	65,481	390	839	5	-	-
Fuelwood									
Softwoods	*Standard*	84,473	5,859	6,300	437	32,544	2,228	45,629	3,194
Hardwoods	*cords*	1,180,069	80,996	210,780	14,454	879,432	60,242	89,857	6,300
Total		1,264,542	86,855	217,080	14,891	911,976	62,470	135,486	9,494
Posts									
Softwoods	*Thousand*	3,228	2,584	2,623	2,100	605	484	-	-
Hardwoods	*pieces*	-	-	-	-	-	-	-	-
Total		3,228	2,584	2,623	2,100	605	484	-	-
Miscellaneous									
Softwoods	*Thousand*	665	665	360	360	-	-	305	305
Hardwoods	*cubic feet*	5,310	5,310	2,778	2,778	-	-	2,532	2,532
Total		5,975	5,975	3,138	3,138	-	-	2,837	2,837
All products									
Softwoods	*Thousand*				57,469		4,988		7,486
Hardwoods	*cubic feet*				167,530		70,481		11,178
Total					224,999		75,469		18,664

[1]Includes coarse and fine wood residues.

[2]Column should no be added to avoid double counting volume.

[3]International 1/4-inch rule.

[4]Includes roundwood and plant byproducts for wood pulp, particleboard and waferboard.

Table 71. -- Output of roundwood products by product, softwoods and hardwoods, and source of material, Minnesota, 1988

(In thousand cubic feet)

Product and softwoods and hardwoods	All sources	Growing stock			Rough and rotten trees	Salvable dead trees	Other sources
		Total	Sawtimber	Poletimber			
Saw logs							
Softwoods	20,756	20,197	19,425	772	168	152	239
Hardwoods	34,391	30,486	25,707	4,779	3,520	41	344
Total	55,147	50,683	45,132	5,551	3,688	193	583
Veneer logs							
Softwoods	2	2	2	-	-	-	-
Hardwoods	2,611	2,364	2,364	-	244	-	3
Total	2,613	2,366	2,366	-	244	-	3
Cooperage							
Softwoods	-	-	-	-	-	-	-
Hardwoods	46	41	41	-	3	-	2
Total	46	41	41	-	3	-	2
Pulpwood[1]							
Softwoods	35,166	33,454	22,439	11,015	338	266	1,108
Hardwoods	123,489	117,407	83,083	34,324	4,017	71	1,994
Total	158,655	150,861	105,522	45,339	4,355	337	3,102
Piling							
Softwoods	529	529	448	81	-	-	-
Hardwoods	-	-	-	-	-	-	-
Total	529	529	448	81	-	-	-
Poles							
Softwoods	395	390	365	25	5	-	-
Hardwoods	-	-	-	-	-	-	-
Total	395	390	365	25	5	-	-
Fuelwood							
Softwoods	2,665	437	141	296	81	1,459	688
Hardwoods	74,696	14,454	4,789	9,665	2,714	30,016	27,512
Total	77,361	14,891	4,930	9,961	2,795	31,475	28,200
Posts							
Softwoods	2,584	2,100	479	1,621	321	80	83
Hardwoods	-	-	-	-	-	-	-
Total	2,584	2,100	479	1,621	321	80	83
Miscellaneous							
Softwoods	360	360	203	157	-	-	-
Hardwoods	2,778	2,778	2,020	758	-	-	-
Total	3,138	3,138	2,223	915	-	-	-
All products							
Softwoods	62,457	57,469	43,502	13,967	913	1,957	2,118
Hardwoods	238,011	167,530	118,004	49,526	10,498	30,128	29,855
Total	300,468	224,999	161,506	63,493	11,411	32,085	31,973

[1]Includes roundwood for particleboard and oriented strand board.

Table 72. -- Timber products from roundwood by species group and product, Minnesota, 1988

Species group	All products	Saw logs		Veneer logs		Pulpwood[1]		Poles		Posts		Fuelwood		Other products
	Thousand cubic feet	*Thousand board feet [2]*	*Thousand cubic feet*	*Thousand board feet [2]*	*Thousand cubic feet*	*Cords*	*Thousand cubic feet*	*Pieces*	*Thousand cubic feet*	*Thousand pieces*	*Thousand cubic feet*	*Cords*	*Thousand cubic feet*	*Thousand cubic feet*
Softwoods														
Jack pine	16,646	34,950	7,057	-	-	92,670	7,304	6,800	40	413	329	23,276	1,610	306
Red pine	11,534	42,863	7,387	-	-	26,361	2,080	58,845	352	504	405	10,785	733	577
White pine	3,691	20,096	3,466	14	2	2,061	159	675	3	5	4	897	54	3
White and black spruce	12,956	7,470	1,505	-	-	145,681	11,420	-	-	-	-	434	30	1
Balsam fir	14,390	4,186	839	-	-	170,513	13,364	-	-	-	-	2,644	185	2
Tamarack	951	253	48	-	-	10,713	839	-	-	15	12	788	52	-
Cedar [3]	2,289	2,260	454	-	-	-	-	-	-	2,291	1,834	20	1	-
Total softwoods	62,457	112,078	20,756	14	2	447,999	35,166	66,320	395	3,228	2,584	38,844	2,665	889
Hardwoods														
White oak	10,408	10,121	1,850	158	26	-	-	-	-	-	-	123,239	8,490	42
Red oak	21,500	47,134	8,704	989	158	-	-	-	-	-	-	183,983	12,637	1
Hickory	281	151	22	-	-	-	-	-	-	-	-	3,716	259	-
Basswood	2,897	14,339	2,349	1,769	288	-	-	-	-	-	-	3,899	257	3
Yellow birch	51	304	47	37	4	-	-	-	-	-	-	-	-	-
Hard maple	4,080	1,630	260	62	8	-	-	-	-	-	-	55,605	3,782	30
Soft maple	3,518	2,383	382	364	57	6,359	499	-	-	-	-	37,276	2,529	51
Elm	19,313	8,120	1,316	143	19	-	-	-	-	-	-	258,681	17,978	-
Ash [4]	6,297	9,502	1,541	498	80	2,393	188	-	-	-	-	65,391	4,488	-
Cottonwood	1,533	3,998	641	348	58	-	-	-	-	-	-	11,979	834	-
Balsam poplar	3,704	450	79	-	-	46,109	3,625	-	-	-	-	-	-	-
Aspen	141,935	82,496	14,849	3,796	615	1,500,734	118,128	-	-	-	-	86,025	5,882	2,461
Paper birch	20,312	13,152	2,148	7,896	1,284	13,348	1,049	-	-	-	-	232,176	15,595	236
Black walnut	337	736	115	99	14	-	-	-	-	-	-	2,988	208	-
Other hardwoods	1,845	561	88	-	-	-	-	-	-	-	-	25,254	1,757	-
Total hardwoods	238,011	195,077	34,391	16,159	2,611	1,568,943	123,489	-	-	-	-	1,090,212	74,696	2,824
All species	300,468	307,155	55,147	16,173	2,613	2,016,942	158,655	66,320	395	3,228	2,584	1,129,056	77,361	3,713

[1] Includes roundwood for particleboard and oriented strand board.

[2] International 1/4-inch rule.

[3] Includes northern white-cedar, and eastern redcedar.

[4] Incudes black, white, and green ash.

Table 73. -- Volume of primary plant residue by use and type of wood residue, and softwoods and hardwoods, Minnesota, 1988

(In thousand cubic feet)

	Wood residue							
	Total		Coarse[1]		Fine[2]		Bark	
Use	Softwoods	Hardwoods	Softwoods	Hardwoods	Softwoods	Hardwoods	Softwoods	Hardwoods
Fiber products[3]	3,987	2,346	3,987	2,346	-	-	-	222
Charcoal	2	122	2	122	-	-	1	79
Industrial fuel	2,459	4,128	443	1,994	2,016	2,134	9,043	25,985
Domestic fuel	735	2,172	719	2,108	16	64	305	1,024
Miscellaneous[4]	303	2,410	89	884	214	1,526	63	865
Not used[5]	1,705	3,796	564	1,771	1,142	2,026	5,824	2,322
Total	9,191	14,974	5,804	9,225	3,388	5,750	15,236	30,497

[1] Suitable for chipping such as slabs, edgings, veneer cores, etc.

[2] Not suitable for chipping such as sawdust, veneer clippings, etc.

[3] For manufacture of pulp, hardboard, roofing felt, particleborad, etc.

[4] Livestock bedding, mulch, small dimension and specialty items.

[5] Includes residue burned as waste.

Table 74. -- All live tree biomass yields on timberland by species group and forest type, Minnesota, 1990

(In pounds per acre green weight)

Species group	Forest type														
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods															
Jack pine	65,288	6,637	3,437	1,266	2,124	1,292	37	209	905	78	163	986	861	161	64
Red pine	6,676	69,130	15,033	1,632	1,645	281	82	196	564	32	342	1,201	1,811	294	-
White pine	1,259	6,156	80,062	1,996	1,612	277	411	307	374	127	1,499	783	1,751	96	-
White spruce	1,519	1,966	7,271	5,748	36,698	325	644	227	125	1,123	703	1,385	2,158	1,457	48
Black spruce	2,131	871	1,835	7,307	3,276	59,896	7,534	8,263	-	478	116	875	792	354	70
Balsam fir	3,517	4,257	11,032	46,628	8,633	4,001	12,356	1,754	91	5,453	2,625	7,078	12,538	7,597	278
Tamarack	146	190	262	1,680	71	7,471	4,222	49,614	-	913	31	277	391	960	1,126
Eastern redcedar	-	20	-	-	-	29	-	-	1,023	12	269	19	78	-	-
Northern white-cedar	12	219	793	5,278	2,060	1,627	79,105	2,442	-	2,605	815	513	1,889	1,824	149
Other softwoods	714	-	-	-	91	-	-	-	63	-	-	6	-	-	-
Total softwoods	81,262	89,446	119,725	71,535	56,210	75,199	104,391	63,012	3,145	10,821	6,563	13,123	22,269	12,743	1,735
Hardwoods															
Select white oak	802	2,673	1,314	247	259	3	12	58	49,291	3,437	9,722	3,392	1,692	460	166
Select red oak	1,409	1,038	3,395	62	-	29	-	188	58,682	557	9,875	3,680	4,934	489	63
Other red oak	4	284	-	9	-	-	-	-	4,554	25	379	86	208	72	-
Select hickory	-	-	-	-	-	-	-	-	1,761	-	115	11	135	-	-
Other hickory	-	-	-	-	-	-	-	-	758	55	326	2	18	-	-
Basswood	77	253	76	121	34	-	18	13	5,858	2,968	29,241	1,992	1,665	453	-
Yellow birch	-	-	97	315	445	15	682	48	20	832	1,981	63	241	92	-
Hard maple	-	535	1,512	201	686	18	152	41	3,306	1,849	37,386	1,840	3,574	624	-
Soft maple	564	1,193	9,902	1,412	2,117	270	151	218	2,617	8,562	10,151	4,229	6,326	490	259
Elm	14	137	309	189	162	32	39	336	5,362	6,588	10,349	1,349	1,433	1,437	67
Black ash	37	173	250	2,157	792	216	5,300	466	986	41,685	5,092	2,453	3,691	6,294	675
White & green ash	2	62	679	81	111	-	152	1	2,090	4,983	8,072	530	306	230	107
Cottonwood	-	46	-	-	-	7	-	-	467	2,785	341	39	10	-	143
Willow	-	29	-	-	-	-	-	-	113	2,532	424	45	28	41	9
Hackberry	-	-	-	-	-	-	-	-	509	423	426	2	-	-	-
Balsam poplar	204	511	619	2,764	1,955	252	1,733	593	331	5,086	1,506	5,106	2,968	59,007	1,859
Bigtooth aspen	863	1,281	221	215	3	44	95	33	1,618	96	1,403	4,274	1,661	42	-
Quaking aspen	9,327	9,131	14,589	14,395	13,488	4,338	2,845	1,560	10,303	6,764	10,219	67,274	19,182	15,921	1,265
Paper birch	4,864	8,421	17,387	14,681	8,563	1,914	8,210	1,474	6,296	4,528	10,120	11,460	73,586	4,807	617
Black cherry	47	24	53	8	20	7	6	1	1,134	183	681	97	175	57	61
Black walnut	-	7	-	-	-	-	-	-	936	243	119	4	10	-	-
Butternut	-	-	-	-	-	-	-	-	1,053	54	223	32	41	-	-
Other hardwoods	6	5	111	-	-	1	-	11	1,915	6,794	2,281	128	41	73	-
Total hardwoods	18,220	25,803	50,514	36,857	28,635	7,146	19,395	5,041	159,960	101,029	150,432	108,088	121,925	90,589	5,291
Noncommercial species	66	152	246	293	563	12	156	22	2,303	454	3,119	469	1,078	239	101
All species	99,548	115,401	170,485	108,685	85,408	82,357	123,942	68,075	165,408	112,304	160,114	121,680	145,272	103,571	7,127

Table 75. -- All live tree biomass on timberland by species group and forest type, Minnesota, 1990

(In green tons)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Nonstocked
Softwoods																
Jack pine	21,382,167	14,928,152	1,245,464	109,463	463,776	117,980	853,996	12,723	73,627	527,451	50,034	113,244	2,491,993	356,309	34,129	3,826
Red pine	20,385,367	1,526,453	12,972,222	478,814	597,948	91,393	185,898	27,881	69,083	328,795	20,357	238,196	3,036,653	749,219	62,455	-
White pine	9,311,673	287,764	1,155,189	2,549,970	731,464	89,549	182,902	140,111	108,258	217,731	81,905	1,044,158	1,977,981	724,380	20,311	-
White spruce	11,600,036	347,357	368,901	231,589	2,106,202	2,038,558	214,956	219,450	80,040	73,012	724,050	490,000	3,500,996	892,665	309,386	2,874
Black spruce	51,650,071	487,200	163,515	58,454	2,677,126	181,996	39,594,384	2,567,474	2,913,225	-	308,217	80,671	2,210,771	327,704	75,184	4,150
Balsam fir	57,096,928	804,203	798,811	351,368	17,084,489	479,540	2,645,079	4,210,782	618,528	52,954	3,516,727	1,828,281	17,890,878	5,185,680	1,613,121	16,487
Tamarack	26,308,993	33,444	35,658	8,336	615,613	3,930	4,938,825	1,438,937	17,491,473	-	588,530	21,825	700,147	161,577	203,848	66,850
Eastern redcedar	893,823	-	3,674	-	-	-	19,306	-	-	596,217	7,631	187,172	47,606	32,217	-	-
Northern white-cedar	35,734,270	2,652	41,017	25,259	1,933,707	114,446	1,075,389	26,958,845	860,759	-	1,680,072	567,415	1,297,136	781,304	387,427	8,842
Other softwoods	219,995	163,144	-	-	-	5,060	-	-	-	36,861	-	-	14,930	-	-	-
Total softwoods	234,583,323	18,580,369	16,784,451	3,813,253	26,210,325	3,122,452	49,710,735	35,576,203	22,214,993	1,833,021	6,977,523	4,570,962	33,169,091	9,211,055	2,705,861	103,029
Hardwoods																
Select white oak	47,954,817	183,417	501,613	41,857	90,338	14,372	2,177	4,148	20,376	28,726,773	2,216,386	6,771,919	8,574,118	699,709	97,749	9,865
Select red oak	53,619,798	322,238	194,767	108,131	22,552	-	19,010	-	66,416	34,200,091	359,345	6,878,730	9,300,331	2,040,624	103,799	3,764
Other red oak	3,310,865	912	53,264	-	3,363	-	-	-	-	2,654,340	15,927	264,074	217,703	86,030	15,252	-
Select hickory	1,188,833	-	-	-	-	-	-	-	-	1,026,144	-	79,897	26,843	55,949	-	-
Other hickory	717,720	-	-	-	-	-	-	-	-	441,773	35,295	227,418	5,694	7,540	-	-
Basswood	31,639,686	17,718	47,475	2,405	44,296	1,874	-	6,062	4,619	3,414,277	1,914,042	20,367,720	5,034,448	688,494	96,256	-
Yellow birch	2,607,995	-	-	3,103	115,250	24,710	9,888	232,439	16,802	11,933	536,706	1,379,533	158,310	99,711	19,610	-
Hard maple	35,759,603	-	100,346	48,145	73,742	38,122	11,649	51,750	14,553	1,926,935	1,192,797	26,041,248	4,649,625	1,478,134	132,557	-
Soft maple	29,152,080	128,943	223,787	315,385	517,327	117,582	178,276	51,321	76,900	1,525,180	5,522,206	7,070,471	10,688,632	2,616,635	104,044	15,391
Elm	19,162,846	3,150	25,746	9,847	69,416	8,978	21,199	13,362	118,420	3,124,965	4,248,701	7,208,369	3,409,002	592,655	305,068	3,968
Black ash	43,105,052	8,354	32,373	7,970	790,268	43,984	142,565	1,806,081	164,244	574,373	26,884,876	3,546,522	6,200,165	1,526,697	1,336,501	40,079
White & green ash	11,697,524	356	11,654	21,637	29,582	6,169	-	51,730	357	1,218,249	3,214,102	5,622,261	1,339,671	126,543	48,842	6,371
Cottonwood	2,429,828	-	8,702	-	-	-	4,376	-	-	271,958	1,796,097	237,406	98,681	4,097	-	8,511
Willow	2,133,735	-	5,529	-	-	-	-	-	-	66,127	1,633,062	295,208	113,115	11,382	8,781	531
Hackberry	870,490	-	-	-	-	-	-	-	-	296,868	272,802	296,503	4,317	-	-	-
Balsam poplar	33,544,597	46,612	95,911	19,709	1,012,632	108,604	166,606	590,474	209,107	192,863	3,280,149	1,049,085	12,904,923	1,227,528	12,530,039	110,355
Bigtooth aspen	14,076,157	197,421	240,310	7,033	78,593	147	28,868	32,225	11,667	942,850	61,866	976,957	10,802,181	687,119	8,920	-
Quaking aspen	213,630,584	2,132,712	1,713,428	464,674	5,274,297	749,269	2,867,604	969,423	549,996	6,004,739	4,362,229	7,117,938	170,034,802	7,933,496	3,380,902	75,075
Paper birch	87,780,552	1,112,252	1,580,131	553,771	5,379,219	475,659	1,265,553	2,797,858	519,598	3,669,073	2,920,120	7,048,916	28,965,953	30,434,979	1,020,869	36,601
Black cherry	1,615,880	10,661	4,527	1,703	2,968	1,136	4,498	2,202	280	660,832	117,854	474,596	246,323	72,582	12,076	3,642
Black walnut	799,394	-	1,297	-	-	-	-	-	-	545,546	156,820	82,589	8,961	4,181	-	-
Butternut	900,339	-	-	-	-	-	-	-	-	613,572	34,748	155,194	79,985	16,840	-	-
Other hardwoods	7,458,845	1,368	930	3,536	157	-	2,991	134	3,944	1,120,435	4,381,845	1,588,650	322,576	16,821	15,458	-
Total hardwoods	645,157,220	4,166,114	4,841,790	1,608,906	13,504,000	1,590,606	4,725,260	6,609,209	1,777,279	93,229,896	65,157,975	104,781,204	273,186,359	50,427,746	19,236,723	314,153
Noncommercial species	5,751,180	15,087	28,576	7,822	107,244	31,264	7,643	53,227	7,666	1,342,145	294,001	2,172,566	1,181,382	445,854	50,709	5,994
All species	885,491,723	22,761,570	21,654,817	5,429,981	39,821,569	4,744,322	54,443,638	42,238,639	23,999,938	96,405,062	72,429,499	111,524,732	307,536,832	60,084,655	21,993,293	423,176

Table 76. -- *All live tree biomass on timberland by species group and tree biomass component, (in green tons), Minnesota, 1990*

(In green tons)

Species group	All components	Tree biomass component						
		All live 1-5-inch trees	Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Softwoods								
Jack pine	21,382,167	2,354,273	1,101,162	15,272,786	1,823,846	49,813	697,714	82,573
Red pine	20,385,367	1,482,568	1,005,656	15,901,629	1,789,841	11,336	174,638	19,699
White pine	9,311,673	414,125	430,310	7,146,913	748,958	33,374	484,566	53,427
White spruce	11,600,036	1,266,708	688,321	7,471,241	1,996,914	12,780	127,224	36,848
Black spruce	51,650,071	23,183,426	1,894,576	19,464,737	6,572,345	36,669	373,317	125,001
Balsam fir	57,096,928	18,284,485	2,832,278	26,557,377	8,314,939	80,934	790,667	236,248
Tamarack	26,308,993	7,245,077	1,284,732	14,524,661	1,872,124	97,034	1,143,924	141,441
Eastern redcedar	893,823	257,706	33,010	370,019	113,152	8,247	84,818	26,871
Northern white-cedar	35,734,270	6,479,213	2,155,830	15,701,064	4,549,802	638,751	4,848,871	1,360,739
Other softwoods	219,995	39,102	9,372	99,317	26,394	3,478	32,479	9,853
Total softwoods	234,583,323	61,006,683	11,435,247	122,509,744	27,808,315	972,416	8,758,218	2,092,700
Hardwoods								
Select white oak	47,954,817	3,137,781	2,218,377	23,477,234	7,328,292	738,731	8,644,862	2,409,540
Select red oak	53,619,798	906,425	2,481,881	31,722,099	9,485,017	491,983	6,689,417	1,842,976
Other red oak	3,310,865	52,313	121,101	1,449,965	429,305	72,197	936,437	249,547
Select hickory	1,188,833	161,325	52,041	614,722	197,855	9,239	118,207	35,444
Other hickory	717,720	106,909	33,901	343,507	123,292	6,559	78,696	24,856
Basswood	31,639,686	2,707,731	1,477,728	17,723,926	5,641,840	234,612	2,981,989	871,860
Yellow birch	2,607,995	173,223	73,084	823,061	250,790	78,421	943,444	265,972
Hard maple	35,759,603	4,555,967	1,205,988	15,147,836	5,165,969	502,635	7,027,315	2,153,893
Soft maple	29,152,080	5,872,401	923,226	11,350,774	4,006,914	375,086	5,004,511	1,619,168
Elm	19,162,846	3,098,710	891,297	9,027,958	2,909,453	218,210	2,306,683	710,535
Black ash	43,105,052	9,373,899	2,259,558	21,080,712	7,500,973	204,402	2,003,299	682,209
White & green ash	11,697,524	1,250,883	464,675	5,818,655	1,857,032	125,752	1,681,022	499,505
Cottonwood	2,429,828	23,813	129,936	1,631,043	384,670	14,652	204,291	41,423
Willow	2,133,735	29,594	83,868	861,553	251,315	59,860	674,102	173,443
Hackberry	870,490	225,130	30,483	316,191	104,208	12,760	138,329	43,389
Balsam poplar	33,544,597	3,691,731	1,165,620	19,397,120	6,538,639	115,823	1,986,385	649,279
Bigtooth aspen	14,076,157	729,232	456,764	8,654,677	2,094,204	83,628	1,677,533	380,119
Quaking aspen	213,630,584	25,301,934	7,596,826	119,145,888	29,718,465	1,478,416	24,638,890	5,750,165
Paper birch	87,780,552	9,904,510	3,722,369	48,329,460	17,283,212	447,694	6,048,695	2,044,612
Black cherry	1,615,880	419,211	35,452	455,442	157,533	30,269	381,543	136,430
Black walnut	799,394	25,618	33,085	468,480	142,208	6,290	96,172	27,541
Butternut	900,339	46,379	21,884	307,992	95,075	22,203	312,497	94,309
Other hardwoods	7,458,845	1,028,521	145,625	1,502,105	514,458	268,391	3,057,295	942,450
Total hardwoods	645,157,220	72,823,240	25,624,769	339,650,400	102,180,719	5,597,813	77,631,614	21,648,665
Noncommercial species	5,751,180	4,054,751	-	-	-	131,716	1,112,330	452,383
All species	885,491,723	137,884,674	37,060,016	462,160,144	129,989,034	6,701,945	87,502,162	24,193,748

Table 77. -- All live tree biomass on timberland by species group and tree biomass component, (in thousand cubic feet), Minnesota, 1990

Species group	All components	Tree biomass component						
		All live 1-5-inch trees	Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Softwoods								
Jack pine	930,207	102,604	47,926	664,257	79,326	2,151	30,351	3,592
Red pine	883,890	66,352	43,513	687,743	77,386	495	7,554	847
White pine	412,168	18,530	19,037	316,192	33,126	1,472	21,442	2,369
White spruce	515,567	57,205	30,555	331,372	88,592	563	5,646	1,634
Black spruce	2,288,744	1,027,037	83,949	862,707	291,338	1,625	16,545	5,543
Balsam fir	2,435,098	780,447	120,749	1,132,241	354,424	3,467	33,707	10,063
Tamarack	1,011,405	286,319	48,830	552,468	71,211	3,679	43,510	5,388
Eastern redcedar	41,931	12,114	1,550	17,347	5,298	386	3,975	1,261
Northern white-cedar	1,973,087	357,446	118,976	867,122	251,330	35,296	267,790	75,127
Other softwoods	10,025	1,778	426	4,525	1,204	158	1,483	451
Total softwoods	10,502,122	2,709,832	515,511	5,435,974	1,253,235	49,292	432,003	106,275
Hardwoods								
Select white oak	1,651,268	108,082	76,397	808,381	252,334	25,473	297,643	82,958
Select red oak	1,666,439	28,157	77,152	985,888	294,781	15,285	207,904	57,272
Other red oak	102,773	1,626	3,755	45,006	13,332	2,238	29,066	7,750
Select hickory	37,504	5,102	1,644	19,386	6,237	292	3,727	1,116
Other hickory	24,326	3,619	1,154	11,641	4,182	220	2,668	842
Basswood	1,500,935	129,964	70,036	839,867	267,329	11,138	141,293	41,308
Yellow birch	85,189	5,643	2,393	26,888	8,191	2,567	30,821	8,686
Hard maple	1,139,225	145,258	38,400	482,510	164,582	16,042	223,833	68,600
Soft maple	1,053,618	212,013	33,371	410,358	144,846	13,574	180,925	58,531
Elm	701,058	117,479	32,352	327,968	105,726	7,924	83,795	25,814
Black ash	1,724,370	375,107	90,383	843,251	300,042	8,143	80,146	27,298
White & green ash	457,907	50,155	18,186	227,093	72,460	4,887	65,623	19,503
Cottonwood	94,970	932	5,095	63,727	15,040	567	7,985	1,624
Willow	89,292	1,241	3,518	36,047	10,517	2,497	28,209	7,263
Hackberry	33,388	8,630	1,164	12,137	3,995	489	5,308	1,665
Balsam poplar	1,274,080	142,113	44,237	735,477	247,927	4,397	75,315	24,614
Bigtooth aspen	561,846	29,410	18,229	345,240	83,551	3,327	66,920	15,169
Quaking aspen	8,533,549	1,020,863	302,917	4,752,978	1,185,534	59,016	982,868	229,373
Paper birch	3,218,329	363,194	136,489	1,771,905	633,611	16,418	221,747	74,965
Black cherry	65,671	17,002	1,448	18,519	6,405	1,238	15,517	5,542
Black walnut	29,870	1,003	1,236	17,476	5,305	233	3,588	1,029
Butternut	40,205	2,072	973	13,758	4,245	991	13,956	4,210
Other hardwoods	323,301	44,569	6,341	65,111	22,288	11,645	132,510	40,837
Total hardwoods	24,409,113	2,813,234	966,870	12,860,612	3,852,460	208,601	2,901,367	805,969
Noncommercial species	230,091	162,226	-	-	-	5,271	44,496	18,098
All species	35,141,326	5,685,292	1,482,381	18,296,586	5,105,695	263,164	3,377,866	930,342

Table 78. -- All live shrub[1] and tree seedling biomass yields on timberland by species group and forest type, Minnesota, 1990

(In pounds per acre green weight)

Species group	Forest type														
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Commercial tree species															
Jack pine	63	-	-	-	-	-	-	-	-	22	-	-	-	-	-
Red pine	-	150	1	-	-	-	-	-	-	-	-	-	3	-	-
White pine	-	1	13	-	-	-	-	-	-	-	1	-	-	11	-
White spruce	-	5	-	33	-	-	12	-	-	-	-	2	-	-	-
Black spruce	-	4	34	1	-	276	40	59	-	22	-	-	2	-	9
Balsam fir	82	29	145	972	17	93	459	8	-	103	25	31	547	52	-
Tamarack	-	-	-	39	-	49	1	142	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	6	-	-	866	154	-	-	-	-	8	-	-
Select white oak	7	1	-	-	-	-	1	-	338	-	8	13	1	-	-
Select red oak	10	50	-	-	-	-	-	-	71	1	8	12	-	-	-
Other hickory	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-
Basswood	-	-	-	-	-	-	-	-	90	1	71	8	23	-	-
Yellow birch	-	-	-	-	-	-	-	-	-	2	-	-	1	1	-
Hard maple	-	38	-	-	-	-	-	-	1	15	536	26	21	-	-
Soft maple	9	103	124	5	-	5	1	-	15	5	74	23	72	1	-
Elm	-	8	-	-	-	-	-	-	253	37	29	22	110	2	-
Black ash	-	-	-	59	5	-	25	5	25	639	24	84	22	101	-
White & green ash	-	-	-	-	-	-	-	-	12	11	44	10	35	-	-
Willow	1	-	-	-	-	25	-	-	-	-	-	3	-	-	-
Balsam poplar	13	1	-	299	-	-	4	20	-	40	3	54	10	238	-
Bigtooth aspen	-	-	-	-	-	-	-	-	-	-	2	7	-	-	-
Quaking aspen	61	39	-	52	285	3	4	37	96	40	131	536	359	77	4
Paper birch	45	7	94	371	-	6	20	7	2	6	3	27	571	5	-
Black cherry	2	6	-	-	-	-	-	-	29	1	20	4	-	1	-
Other hardwoods	-	-	-	-	-	-	-	-	30	10	1	1	4	-	-
Total	293	442	411	1,837	307	457	1,433	432	962	955	986	863	1,789	489	13

(Table 78 continued on next page)

(Table 78 continued)

Species group	Forest type														
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Noncommercial tree species															
Mountain maple	4	20	-	73	-	-	78	-	19	29	75	48	441	18	1
American hornbeam	-	-	-	-	-	-	-	-	-	-	33	1	-	-	-
Eastern hophornbeam	-	-	-	-	-	-	-	-	20	2	92	9	19	-	-
Pin cherry	6	38	-	-	-	-	-	-	-	-	1	14	2	5	-
Chokecherry	36	23	1	-	-	-	-	1	34	64	36	21	44	32	-
Mountain ash	-	-	-	1	-	1	51	-	3	1	1	-	-	-	-
Hawthorn	1	-	-	-	-	-	-	-	136	-	-	-	24	26	-
Peachleaf willow	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-
Total	47	81	1	74	-	1	129	1	212	96	238	93	530	93	1
Tall shrub species															
Witch hazel	-	18	-	10	-	-	-	-	11	12	1	8	7	-	-
Common ninebark	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Juneberry	59	46	12	5	3	3	9	-	41	4	9	294	103	13	-
Beaked hazel	296	230	17	121	-	11	26	14	201	171	108	406	675	78	-
Bog birch	-	-	-	-	-	40	-	171	-	-	65	1	6	-	5
Alder spp.	662	612	38	932	254	1,323	1,525	1,332	140	1,789	21	751	466	1,157	1,453
Sumac	-	-	-	-	-	-	-		68			-	7		
Dogwood	48	86	1	13	-	5	75	33	27	11	7	96	26	38	138
Willow clumped	47	28	-	55	214	8	-	205	6	116	-	681	58	145	280
Misc. tall shrubs	10	9	-	3	3	15	191	95	69	31	87	435	45	33	29
Total	1,123	1,029	68	1,139	474	1,405	1,826	1,850	563	2,134	298	2,672	1,393	1,464	1,905
Low shrub species															
Bunchberry	11	2	4	8	1	3	9	1	-			2	2	4	
Virginia creeper	-	-	9	-	-	-	-	-	6	1	3	1	-	-	-
Labrador tea	-	1	-	12	-	60	24	47	-	1	-	2	-	1	4
Leatherleaf	-	-	-	-	-	3	-	6	-	-	-	-	3	-	-
Bog laurel	-	-	-	-	-	6	-	23	-	-	-	-	1	-	-
Sweetfern	1	10	-	-	-	-	-	-	-	1	1	-	1	1	-
Gooseberry-current	1	-	-	1	2	-	5	1	14	7	8	3	2	5	5
Raspberry-blackberry	17	16	15	8	15	6	16	8	7	19	11	20	16	9	14
Rose	5	5	2	2	1	-	-	-	-	1	1	3	2	2	-
Bilberry-blueberry	22	19	14	12	2	15	2	8	-	1	1	4	12	-	-
Bush honeysuckle	10	3	3	2	-	-	-	-	-	-	1	3	3	-	-
Honeysuckle	9	8	-	3	4	-	4	-	1	4	1	3	3	-	5
Poison ivy	5	1	-	-	-	-	-	-	3	2	3	3	5	-	2
Bog rosemary	-	-	-	-	-	1	-	3	-	-	-	-	-	-	-
Grape	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-
Strawberry	2	3	1	2	4	-	1	1	1	2	2	2	3	1	-
Misc. low shrubs	200	231	27	235	127	158	289	162	69	174	107	177	216	186	155
Total	283	299	75	285	156	252	350	260	102	215	139	223	269	209	185
All species	1,746	1,851	555	3,335	937	2,115	3,738	2,543	1,839	3,400	1,661	3,851	3,981	2,255	2,104

[1] Includes trees less than 1.0 inch d.b.h.

Table 79. -- Sampling errors[1] for Forest Survey Unit and county totals of area of timberland, volume, average net annual growth, and average annual removals on timberland, Minnesota, 1990

(Sampling error in percent)

Forest Survey Unit and county	Area of timberland	Growing stock			Sawtimber		
		Volume	Average net annual growth	Average annual removals	Volume	Average net annual growth	Average annual removals
Aspen-Birch Unit							
Carlton	2.37	4.56	7.14	47.83	7.59	9.52	77.77
Cook	1.84	3.07	6.28	30.03	4.52	6.99	36.88
Koochiching	1.16	2.28	3.80	18.25	3.81	4.91	25.99
Lake	1.50	2.79	5.02	27.73	4.28	5.76	41.99
St. Louis	0.84	1.62	2.78	15.82	2.50	3.14	22.38
Total	0.57	1.08	1.88	10.08	1.69	2.21	14.22
Northern Pine Unit							
Aitkin	1.43	2.87	4.35	20.17	4.14	5.25	18.36
Becker	2.07	3.88	7.09	30.17	5.41	7.39	28.35
Beltrami	1.31	2.63	4.29	13.93	3.79	4.84	13.05
Cass	1.30	2.44	3.94	13.45	3.35	4.20	13.92
Clearwater	2.24	4.25	6.58	27.06	6.14	7.51	27.63
Crow Wing	1.92	3.64	5.38	20.53	5.17	5.88	20.43
Hubbard	1.89	3.73	5.35	19.53	5.48	6.34	20.92
Itasca	1.04	2.09	3.51	9.82	2.85	3.67	9.64
Lake of the Woods	1.91	4.55	6.87	36.31	7.27	8.85	34.27
Mahnomen	3.57	6.79	11.83	49.66	10.61	13.57	49.88
Roseau	2.56	6.28	8.93	57.51	9.42	12.47	53.14
Wadena	3.46	8.17	9.99	44.43	12.03	12.86	42.15
Total	0.49	0.98	1.55	5.51	1.39	1.74	5.41
Central Hardwood Unit							
Anoka	8.29	21.67	35.98	-	27.46	47.83	-
Benton	8.23	23.26	44.76	105.56	28.61	45.04	108.34
Carver	11.07	29.49	51.82	-	36.74	51.79	-
Chisago	6.96	16.77	44.67	56.67	20.88	39.64	57.25
Dakota	13.77	31.58	89.91	106.11	38.48	75.97	138.72
Douglas	8.63	17.05	78.27	568.44	19.39	48.84	-
Fillmore	4.88	10.33	27.14	51.09	11.69	23.36	46.99
Goodhue	5.85	11.47	40.58	42.42	13.10	27.50	42.90
Hennepin	14.30	25.80	67.46	-	27.86	52.77	-
Houston	4.19	8.97	22.62	42.62	10.48	19.13	39.88
Isanti	6.66	16.44	31.03	161.43	26.22	49.00	196.32
Kanabec	4.10	9.65	19.87	40.02	13.87	20.64	51.60
Le Sueur	10.27	20.71	60.51	85.40	22.36	60.35	108.29
Mille Lacs	4.12	9.25	20.24	49.31	13.70	21.38	66.46
Morrison	3.76	7.89	16.18	31.88	11.47	15.99	40.70
Olmsted	7.60	16.05	44.73	71.62	20.35	39.78	66.85
Otter Tail	3.36	7.84	23.22	29.93	10.31	18.76	35.65
Pine	2.20	5.16	10.90	24.27	8.02	11.46	31.05
Ramsey	-	-	-	-	-	-	-
Rice	10.90	24.44	47.23	-	28.66	62.21	-
Scott	12.87	29.90	78.42	251.71	32.10	74.43	281.45
Sherburne	6.81	15.89	31.42	85.12	22.61	29.34	100.79
Stearns	5.83	14.13	56.84	69.76	17.94	40.78	75.69
Todd	4.94	11.93	51.61	60.66	15.55	33.39	66.23
Wabasha	5.89	12.85	35.32	50.74	15.39	28.92	47.17
Washington	9.94	22.75	44.99	-	27.51	43.57	-
Winona	4.31	8.85	23.87	34.37	10.24	20.28	31.65
Wright	7.37	17.45	51.56	79.75	19.87	47.46	92.72
Total	1.02	2.30	5.49	10.42	3.01	5.22	11.54

(Table 79 continued on next page)

(Table 79 continued)

Forest Survey Unit and county	Area of timberland	Growing stock			Sawtimber		
		Volume	Average net annual growth	Average annual removals	Volume	Average net annual growth	Average annual removals
Prairie Unit							
Big Stone	34.46	66.25	95.62	-	107.90	165.31	-
Blue Earth	10.06	17.03	47.59	131.32	20.30	71.46	114.55
Brown	16.49	25.45	57.40	374.51	31.06	164.90	307.06
Chippewa	19.47	37.72	59.54	-	49.61	89.69	-
Clay	12.56	19.07	62.06	53.54	25.76	49.38	54.80
Cottonwood	26.70	87.76	87.09	-	110.08	182.66	-
Dodge	21.24	34.33	71.20	76.24	41.54	65.08	64.07
Fairbault	17.76	31.62	53.64	316.52	35.03	64.36	356.27
Freeborn	19.47	24.85	81.86	309.24	27.17	72.04	270.80
Grant	25.23	37.10	-	98.92	45.49	124.65	78.83
Jackson	36.33	39.66	122.69	-	42.46	134.42	-
Kandiyohi	13.00	20.35	49.03	-	23.40	51.87	-
Kittson	7.40	14.97	30.73	115.03	30.93	67.15	367.01
Lac qui Parle	22.56	52.71	264.36	458.68	68.13	-	359.74
Lincoln	-	-	-	-	-	-	-
Lyon	38.53	38.46	84.20	512.82	47.75	82.92	422.35
McLeod	20.48	38.21	164.86	155.51	42.10	105.14	126.26
Marshall	5.17	11.26	20.29	39.85	22.42	37.26	76.56
Martin	29.85	86.38	126.65	264.82	108.44	162.48	300.69
Meeker	13.06	21.56	49.33	374.51	25.22	49.99	280.31
Mower	22.73	42.99	93.46	192.12	50.25	82.92	163.14
Murray	31.46	43.50	93.05	-	47.89	87.95	-
Nicollet	15.57	21.70	56.27	88.44	26.09	63.54	76.06
Nobles	-	-	-	-	-	-	-
Norman	11.75	19.85	57.30	72.34	26.44	57.12	70.39
Pennington	10.12	17.74	32.11	86.53	29.86	46.35	108.37
Pipestone	54.49	71.95	193.99	-	86.71	138.14	-
Polk	7.80	11.88	25.89	30.46	17.15	30.91	33.71
Pope	16.95	29.92	88.12	152.89	36.50	84.54	146.15
Red Lake	11.42	23.86	63.72	106.35	39.32	57.87	149.58
Redwood	19.47	27.08	110.59	167.49	31.22	98.46	162.16
Renville	22.73	28.17	125.62	-	32.32	91.19	-
Rock	-	-	-	-	-	-	-
Sibley	13.73	21.24	52.50	127.22	24.63	65.18	113.76
Steele	19.47	43.04	90.67	116.88	50.54	115.74	132.49
Stevens	34.46	102.95	150.84	-	170.24	153.44	-
Swift	40.25	87.87	190.36	248.76	112.15	164.49	228.87
Traverse	-	-	-	-	-	-	-
Waseca	17.38	23.88	62.81	-	26.84	67.35	-
Watonwan	40.25	85.09	-	-	92.13	-	-
Wilkin	-	-	-	-	-	-	-
Yellow Medicine	32.86	63.64	-	130.26	69.32	-	120.05
Total	2.36	4.11	9.38	17.10	5.53	11.83	18.72
All counties	0.36	0.71	1.30	4.86	1.02	1.45	6.03

[1]Sampling error is not calculated when the estimated area, volume, or removals for a county is equal to 0, or growth is less than or equal to 0.

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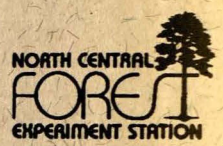
Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.